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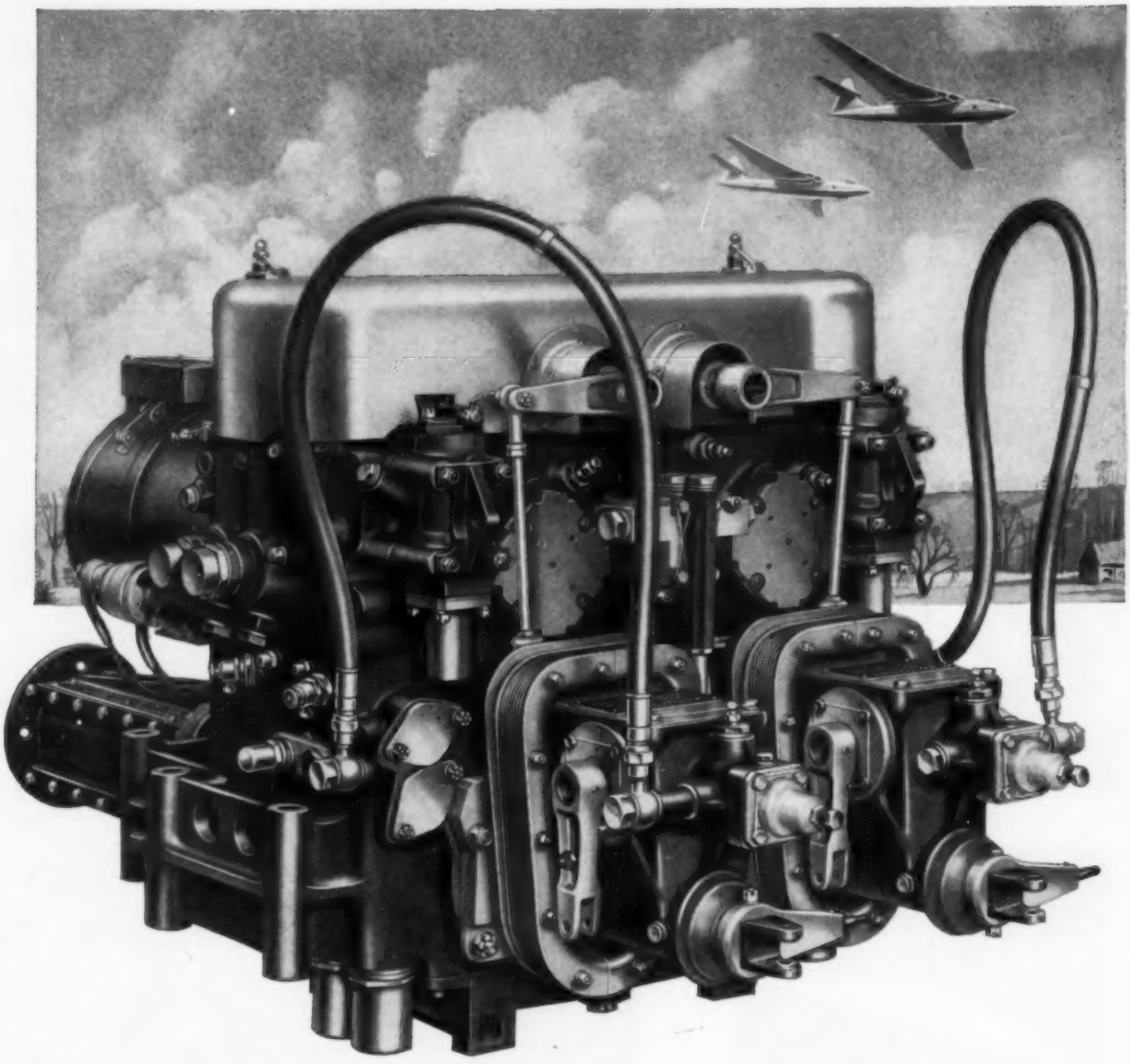

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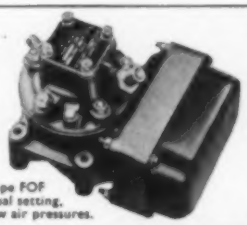
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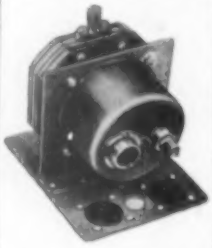
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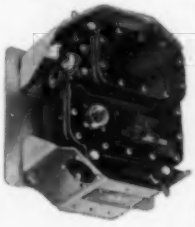
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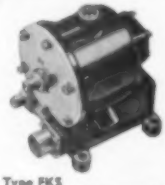
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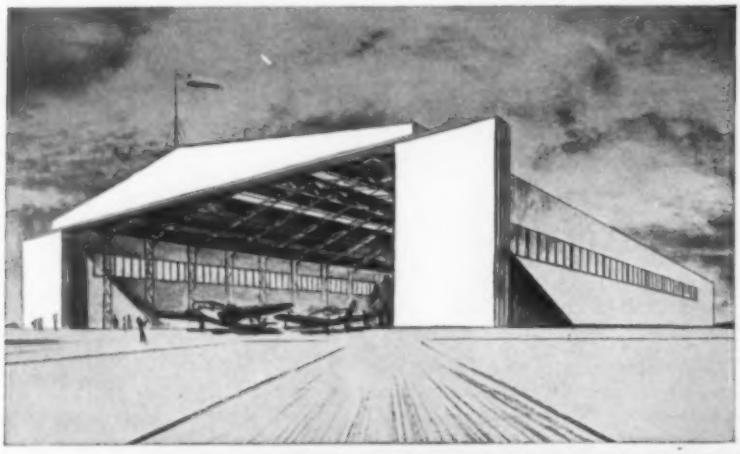

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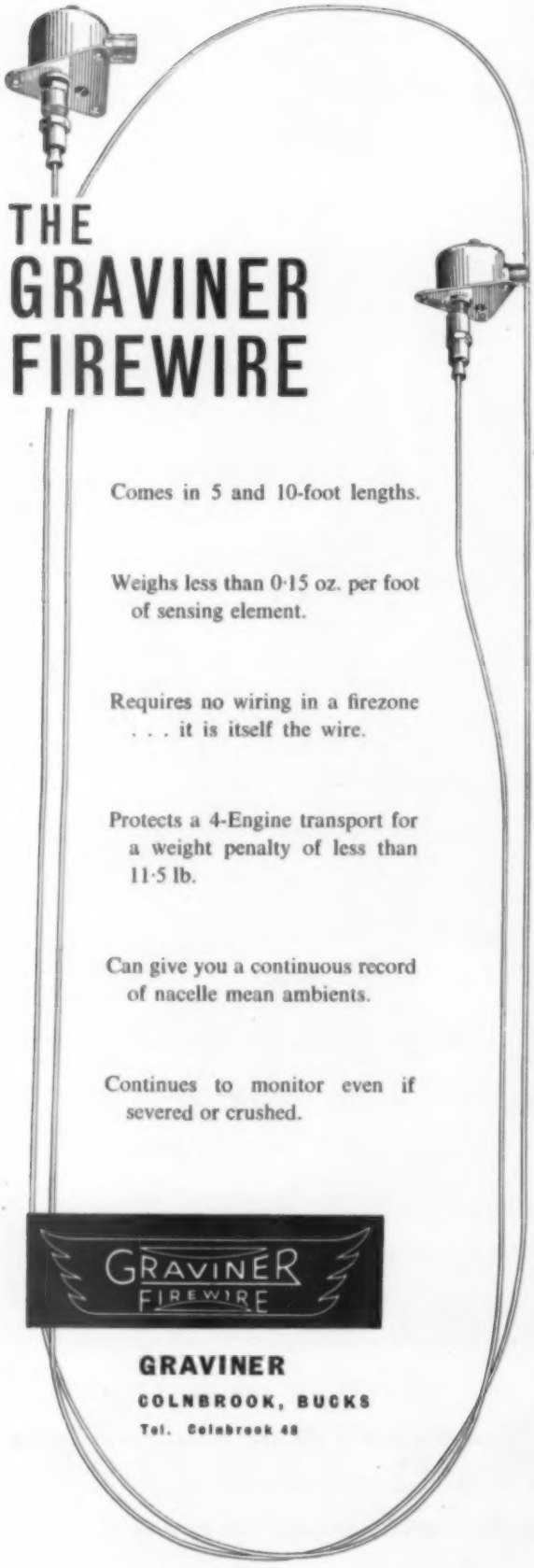

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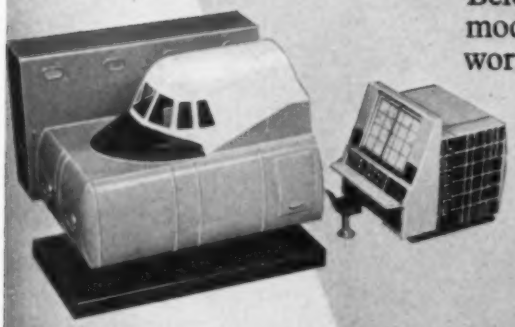

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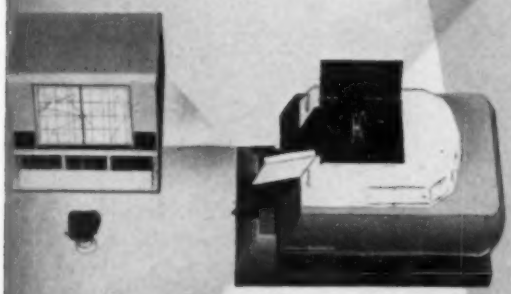

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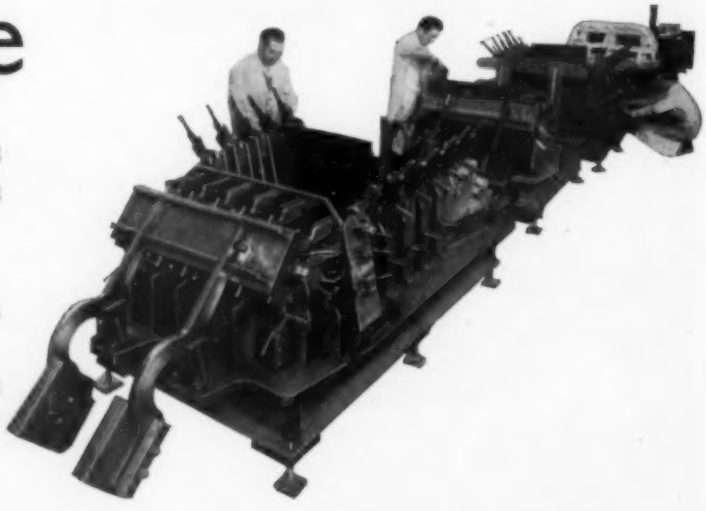

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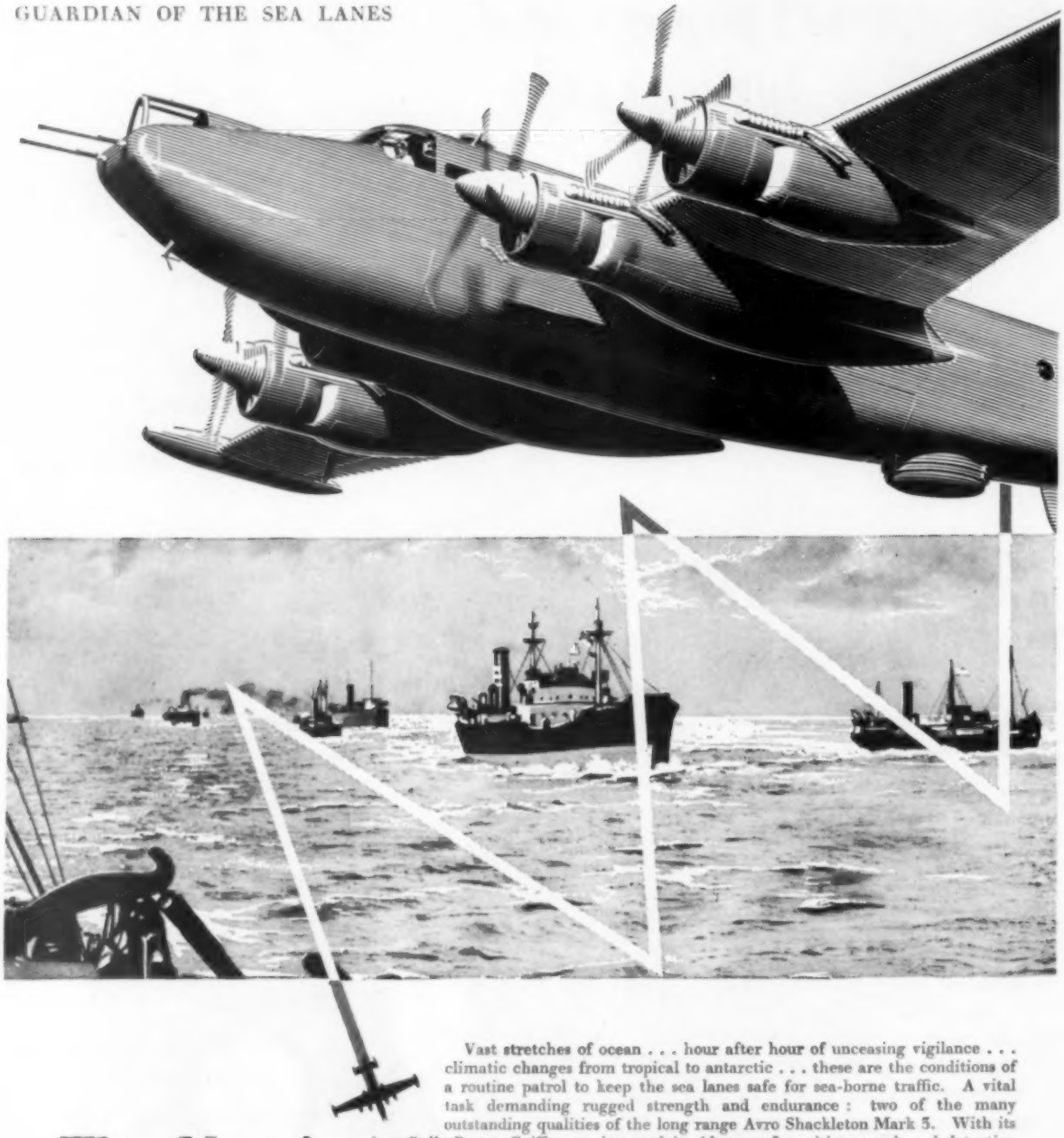

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FLIGHT and AIRCRAFT ENGINEER

No 2459 Vol 69 FRIDAY 9 MARCH 1956

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Training for Technology

THE immediate objectives of the Government's five-year plan for technical education, disclosed in a White Paper last week, are to increase by 50 per cent the output of students from advanced courses at technical colleges; to double the numbers released by employers for part-time day courses; and to spend some £100m on new buildings and equipment. The main avenue of advance to the highest qualifications will be "sandwich" courses of alternating theory and practice; and most full-time and sandwich courses are to be concentrated in colleges of advanced technology.

No specific mention of the aircraft industry is made, the expansion programme envisaged being aimed at producing more and better technologists, technicians and craftsmen for science and industry as a whole. If the plan is successfully accomplished this country's aircraft industry (at present crying out for good men) will obviously share in the results: in a few years' time more technicians and craftsmen will have been trained and more boys will have entered the industry at apprenticeship level; those passing through technical colleges will have more opportunity to progress further; and at a higher level both industry and the universities will be sending more students to carry out post-graduate work at the College of Aeronautics at Cranfield.

The omission of any reference to a planned expansion of the work of the College of Aeronautics seems short-sighted. Doubtless the authors of the White Paper considered themselves to be concerned with thousands of students, not hundreds, and that the future of one specialist institution was irrelevant to the main plan. Nevertheless, a logical and inevitable consequence of the published scheme must be an expansion of activity at Cranfield—a widening of the range of subjects taught and under research, and an increase in the numbers of students.

Much space in the White Paper is devoted to the task of "selling" technical education—to parents, teachers, employers, trade unions and the general public, all of whom are urged in the national interest to support the Government's plan. A major factor if the plan is to be a success is the attitude of individual employers: the provision of facilities for any young man or woman to continue to advanced training is only one aspect of the complete and imaginative approach to the problem that is required.

The employers' responsibility to youth is three-fold. Firstly, the practical training offered at a firm's own factory should be an *effective* apprenticeship, be it full, sandwich, or short-period. It should not be the casual and frustrating semi-vacuum experienced by so many in the past.

Secondly, the firm's attitude towards day-release, sandwich and full-time advanced courses at colleges and universities should be an *enlightened* one. The firm's own short-term interest should not over-ride the line of best development for the individual concerned.

Thirdly, the student technician's endeavours in achieving a sound education should be matched by honesty and integrity of purpose on the part of the employer after training is completed. Firms may need to be reminded that it is for them to give students good reason to join and stay with their particular organizations.

The Government's plan, it seems, is being implemented with a healthy urgency. Local education authorities have been asked to submit particulars of forthcoming additional building projects for further education, and a one-day conference on sandwich courses is to be held by the Ministry of Education and the British Association for Commercial and Industrial Education on March 22nd in London. Increased facilities are useless, however, if the youth of this country chooses to look the other way. The major responsibility, as we have emphasized, is that of industry to prove itself progressive. Such a lead can then be justly followed by parents, teachers and the general public; and students themselves can enter industry with a firm confidence in its future.

FROM ALL QUARTERS

The Air Estimates

THE assertion that, while modern conditions did not call for a very large air force, there would always be a requirement for fighters and bombers to be used in limited wars, was among the points made by Mr. Nigel Birch, Secretary of State for Air, in presenting the Air Estimates for 1956-57 to the House of Commons on Monday last. [The Estimates, and the Minister's memorandum accompanying them, were summarized in *Flight* last week.]

After presenting the argument outlined in the Defence White Paper that no aggressor was likely to succeed if his own country had been subjected to nuclear bombardment. Mr. Birch said that the V-bombers were, therefore, not only our main contribution to the deterrent, but were also our best means of defence if war should come.

But, he commented, a bomber force was of little value if it could be surprised and destroyed on the ground. There was therefore a need for an up-to-date early-warning system linked with the Continent and harnessed to a comprehensive modern air defence organization, the whole forming not only an essential part of the primary deterrent but also giving a measure of warning and protection to the civil population.

It was to this end that our air forces—notably 2nd T.A.F.—were deployed to Europe as part of the NATO contribution to the deterrent.

Mr. Birch went on to remark that, in respect of both "cold" and "limited" wars, the prospects were not so remote. Nor did limited-war operations call for the use of high-performance aircraft. Experience in Kenya and Malaya had shown that we could to a large degree rely on older or less complex aircraft; indeed, they were better fitted for this rôle.

He believed there would always be a requirement for aircraft, both fighters and bombers, for local action in limited wars and that there was little or no chance in the future that aircraft in this sort of task could ever be replaced. Indeed, the more "sophisticated" guided missiles became, the more they would be tied to complex ground radar systems.

Mr. Birch then made detailed comments on a number of aircraft types now in service. He mentioned that the first Valiant squadrons were in service and were building up at an encouraging pace. The Vulcan and Victor would have a superior performance to the Valiant, and it was hoped to see the Vulcan in squadron service this year. The performance of later marks of these aircraft represented a considerable development potential. The Canberra remained the aircraft on which our tactical bomber forces depended, and it was the Government's belief that it was better than any of its counterparts on the other side of the Iron Curtain.

Mr. Birch conceded that the fighter position was not, perhaps, as encouraging as expected, but contended that there were favourable prospects in the marks now being developed.

For all-weather protection reliance was being placed on the Javelin. Although the delay in its appearance in squadron service was to be regretted, the situation now was that more powerful marks would be delivered into squadron service in greater numbers than expected. The Javelin was intended to carry "in due course" the second generation of air-to-air guided missiles.

Mr. Birch replied, in passing, to criticism about the transport of troops in Shackletons. He admitted that these aircraft were not designed for the job and were far from comfortable to travel in, but remarked that emergencies were not comfortable things. In fact, a very careful long-distance exercise had been carried out some time before the recent operation in the Middle East to make sure that troop-carrying in Shackletons was a feasible proposition, and the move took place with complete success.

Dealing with surface-to-air guided weapons, Mr. Birch said that it was not intended to bring these into operational use until they had been subjected to full tests in the context of an operational system. The aim was to use these weapons to destroy enemy aircraft over the sea well away from our shores. It followed that the longer the range of the weapon the more difficult it was to perfect.

In the subsequent debate there was some hard hitting from Members on both sides. Mr. de Freitas (Lab., Lincoln) said that well informed people were describing the Air Force as less effective in relation to the threat which it had to meet than at any time since 1938; A. Cdre. Harvey (Con., Macclesfield), after speaking at some length about the delays in Victor production ("orders issued in penny packets . . . far too many modifications"), turned to fighters, saying it might have been better to manufacture a transatlantic type under licence; and Mr. P. B. Lucas (Con., Brentford and Chiswick) said the R.A.F. was too remote from the aircraft manufacturers.

In reply to Mr. J. Maclay (Nat. Lib. and Con., Renfrew W.), who moved an amendment urging the need to re-equip Transport Command, Mr. Christopher Soames, Under-Secretary for Air, described a new three-year programme. Between now and March 1957 the Command would be joined by Beverleys and Comet 2s, and would be running down on Hastings. Between March 1957 and March 1958 it would be joined by more Comets; and between 1958 and 1959 the Britannias were due. The Comets' floors would be strengthened to carry light freight. The first Beverleys would join Transport Command next week. The Britannia 253 would be able to carry 100 passengers over a stage of 2,500 miles. When the programme was complete the Command would be able to carry three times the number of passengers at a considerably greater speed.

Giving figures on air trooping, Mr. Soames said that in 1954-55 172,000 troops were carried by air, compared with 121,000 by sea. Charter companies had carried 92 per cent and Transport Command 8 per cent.

Javelin Variants

ILLUSTRATED on this page are four marks of the Gloster Javelin all-weather fighter. Since the prototype GA.5 flew late in 1951 an enormous development programme has gone ahead. In spite of setbacks (which have received more than their fair share of publicity, as is often the case) the results can be fairly assessed as satisfactory, and the future of the Javelin never looked better.

A large number of Javelins have been delivered to Maintenance Units for final re-working to Fighter Command standard. Later this year squadrons of Javelin 1s will become operational as fast as air- and ground-crews can be converted. Armed with four 30mm cannon and guided missiles, all under the control of

PHASED DEVELOPMENT: With almost 1,000 sq ft of wing apiece the Gloster Javelins, some scores of which are probably flying by this time, are among the largest fighters in existence. Current marks, referred to on this page, are the Mk 1 (upper left), Mk 2 (upper right), Mk 4 (lower left), and Mk 7 (lower right). The serial numbers of the machines depicted are XA 564, XD 158, XA 630 and XA 560.

THE SNOW QUEEN: Snow from the Filton runway flurries around Bristol Britannia 100 G-ANBE. This machine—the fifth production Britannia—has now been handed over to B.O.A.C. and has undergone three-engine take-off and climbing tests at Filton before delivery to London Airport. The sixth Britannia, G-ANBF, is already flying. (Other Britannia news on page 261.)

the most advanced radar system ever mounted in a British fighter, these aircraft will revitalize our all-weather and night defensive system.

Succeeding the Mk 1 in production are the Mks 2 and 4, both of which—as the photographs indicate—are superficially similar to the Mk 1. Following these will be the Javelin 7, which, as the size of the intakes on the Mk 7 test-bed reveals, will have Armstrong Siddeley Sapphires of increased thrust. All types now have a new fairing around the jet-pipes—known as a "pen-nib" fairing, it is visible on the Mk 4—to push out the buffet boundary. The production-type radome over the nose is pointed, and is visible on the Mk 2 aircraft. The Mks 1 and 4 are fitted with a slave nosecap of painted metal, probably for ferrying. The Mk 7 has a research nose, with a Mach probe. All mark numbers carry the official prefix FAW (fighter, all-weather).

Three-company Nuclear Physics

FOLLOWING the recent disclosure by Rolls-Royce, Ltd., of their plans to proceed with development work towards the nuclear-energy propulsion of aircraft comes news of the formation of a group in which both they and Vickers, Ltd., are concerned, together with a third firm. The announcement, which is made by Vickers, states that a company is to be registered under the title of Vickers Nuclear Engineering, Ltd., and that the other two firms are Rolls-Royce, Ltd., and Foster Wheeler, Ltd. (an engineering concern with several years' experience of nuclear engineering). First directors will be Sir Ronald Weeks, Lord Hives, Maj-Gen. C. A. L. Dunphie and Mr. Geoffrey H. Hopewell. The initial task, it is stated, will be the application of nuclear energy to marine propulsion; Rear-Admiral Rebbeck, who has joined the Vickers group, will be in executive charge of the project.

Area Rule Limits

DURING a technical meeting of the American Institute of the Aeronautical Sciences, Mr. Richard T. Whitcomb, director of transonic tunnels at the N.A.C.A.'s Langley laboratory, discussed area rule (explained in *Flight*, September 30th, 1955), for which he was chiefly responsible. In some cases, he said, direct application of the rule had proved workable and effective up to M=2 (1,320 m.p.h. at altitude), whereas there had been instances of its failure at Mach numbers greater than 1.4 (925 m.p.h.). In the latter cases there were other ways of reducing interference drag.

Army Estimates Debate

IN the course of the Commons Debate on the Army Estimates (see page 271) Mr. Head, Secretary of State for War, said that the R.A.F. was producing three squadrons of single-engined Pioneers to support the special "short notice" brigade. One squadron would be in the Far East, one in the Middle East, and one at home. The squadrons will be completed by April. The twin-engined Pioneer, said Mr. Head, was probably going to be an excellent aircraft, and he added, "We are interested in the tail-loading aspect."

Mr. Head later disclosed that the R.A.F. hoped to have twelve Beverleys in service this year, and that a Guided Missile Wing had been started at Larkhill.

The Graham Land Survey

DESPATCHES from the base camp at Deception Island, near the Antarctic Circle, suggest that all continues to go well with the Graham Land survey, which is being conducted by Hunting Aerosurveys for the British Government.

A recent message from the expedition leader, Peter Mott, said that a thousand square miles of aerial photography had been completed by the two Canso flying-boats, and it is also reported that good progress is being made with the survey work on the ground. In this latter activity an S-51 helicopter—one of two operated for the expedition by Autair, Ltd.—is employed for transporting working parties and their equipment from the ship, *Oluf Sven*, to the various fields of operation. Such landings—which have included one on a mountain-top—save a great deal of time in the short Antarctic summer, as they short-circuit natural obstacles, such as ice-cliffs, which form a barrier to sea landings.

The 900-ton *Oluf Sven* has a flight deck measuring 80ft × 30ft, removable in sections, constructed over her two cargo hatches forward, and the holds provide storage and workshop space in which to maintain the helicopters and other equipment for the expedition.

The two pilots, Capts. Greville Jacques and Stanley Holdaway, are both experienced in helicopter operations in a wide variety of overseas conditions.

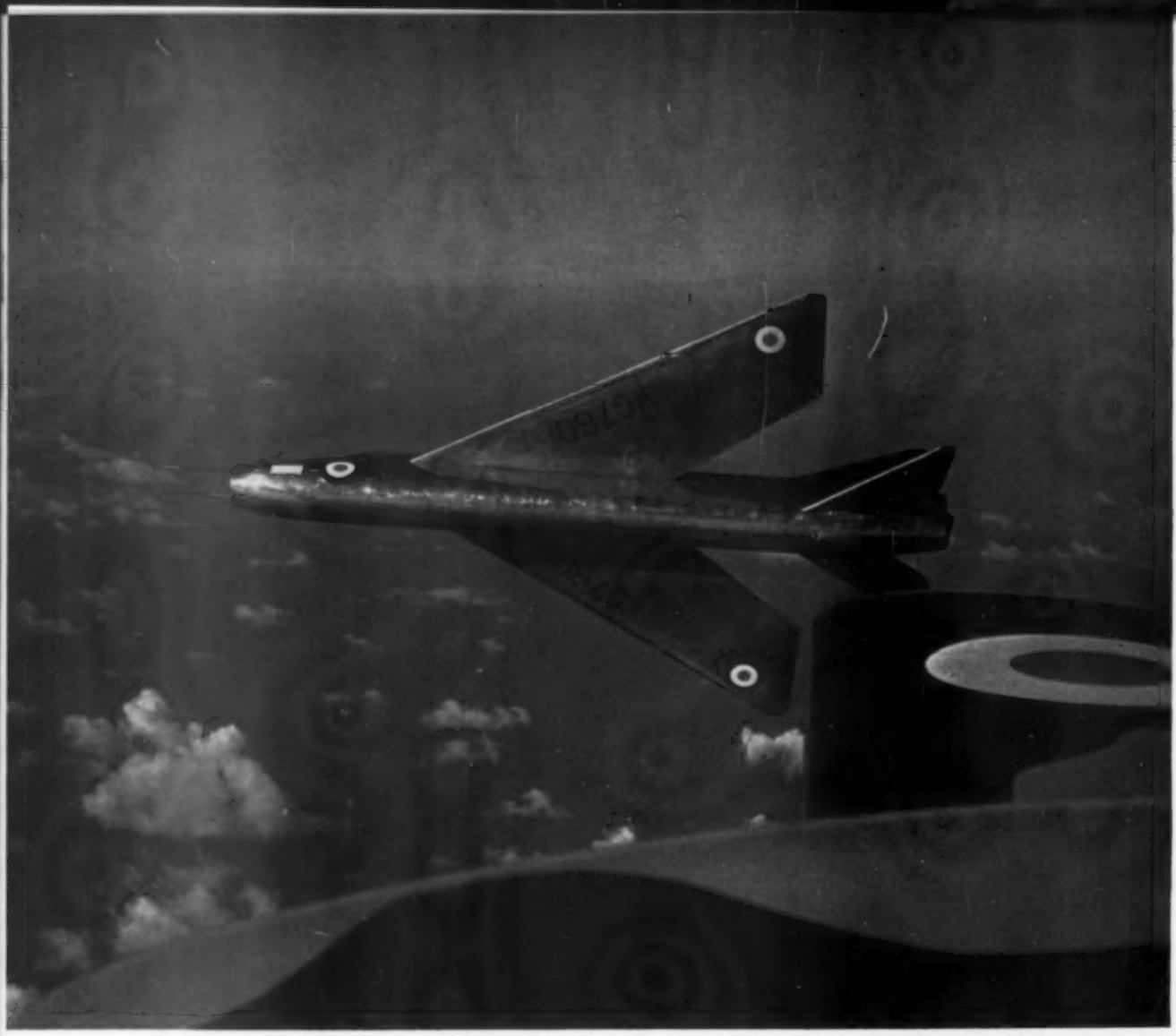
NEW ROLE for the Auster A.O.P. Mk 9 is that of flare-dropping. Here four 4in flares are seen attached to a standard light bomb carrier on the underside of the sturdy steel-tube fuselage.

LATIN SCHOLARS: Now at R.A.F. Station Upwood to study Canberra servicing techniques are these Peruvian Air Force technicians. They recently completed a course at the English Electric Company's technical school at Samlesbury, where this group was photographed (in command is Maj. Manuel Valdivieso, third from left, back row). The party have also visited Dowty, Dunlop and Marconi. The first of eight Canberra B(I)8s for Peru will be handed over shortly.

"FLIGHT"

Owing to the dispute in the printing trade, "Flight" has once again had to appear in a somewhat reduced size. At the time of going to press, however, it seems unlikely that copies will be late reaching readers.

258-259
FLIGHT
9 *March*
1956

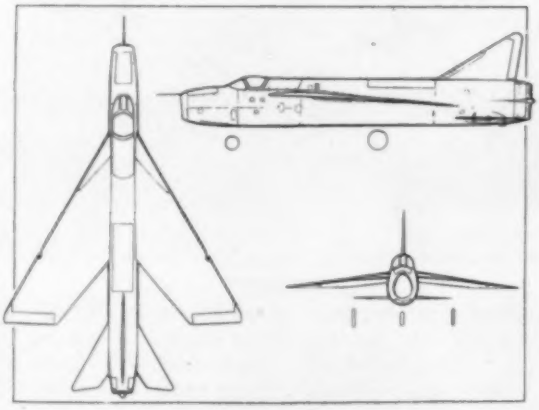


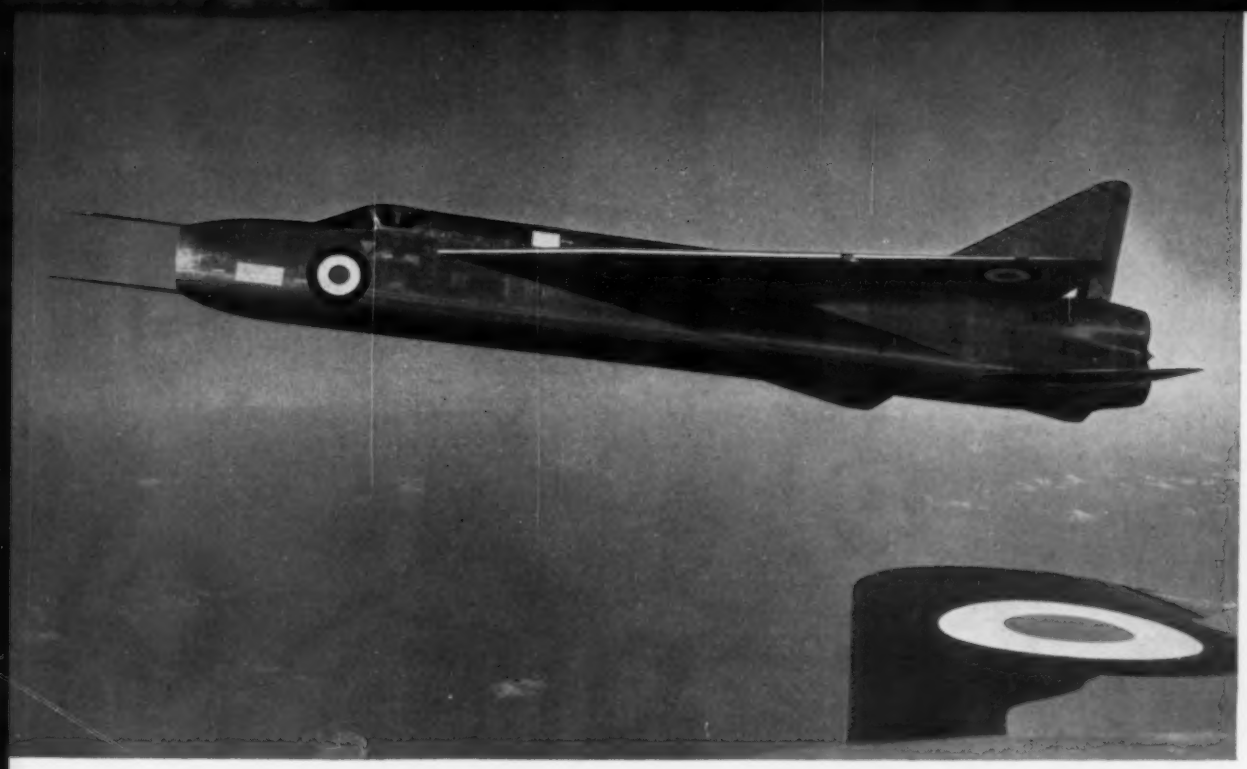
AN ARROW IN THE AIR

English Electric's Supersonic Fighter Shown Off for the Camera

ALTHOUGH taken some eighteen months ago, the photographs on these pages have only just been released for publication by the Ministry of Supply and Air Ministry. Nevertheless they lose little on that account, for the fighter which they depict has changed only slightly—superficially, at least—in the intervening period. It is WG 760, the first prototype English Electric P.1A (two Armstrong Siddeley Sapphires) flown from the company's airfield at Warton, Lancs, by W/C. Roland Beamont, D.S.O. and Bar, O.B.E., D.F.C. and Bar, D.F.C. (U.S.A.), A.R.Ae.S., the company's manager (flight operations) and chief test pilot. The photographic machine was a Meteor N.F.11.

The first flight of the P.1 was on August 4th, 1954, and shortly after that event it was announced that in addition to the usual prototypes the Ministry of Supply had ordered some 20 pre-production aircraft for development trials. This would make it possible to carry out many of the flying and equipment tests concurrently, and so shorten the development period. Within a few days the P.1 exceeded the speed of sound in a dive on several occasions and shortly thereafter was regularly achieving supersonic speed in level flight without the use of afterburning or any other power-boosting device.

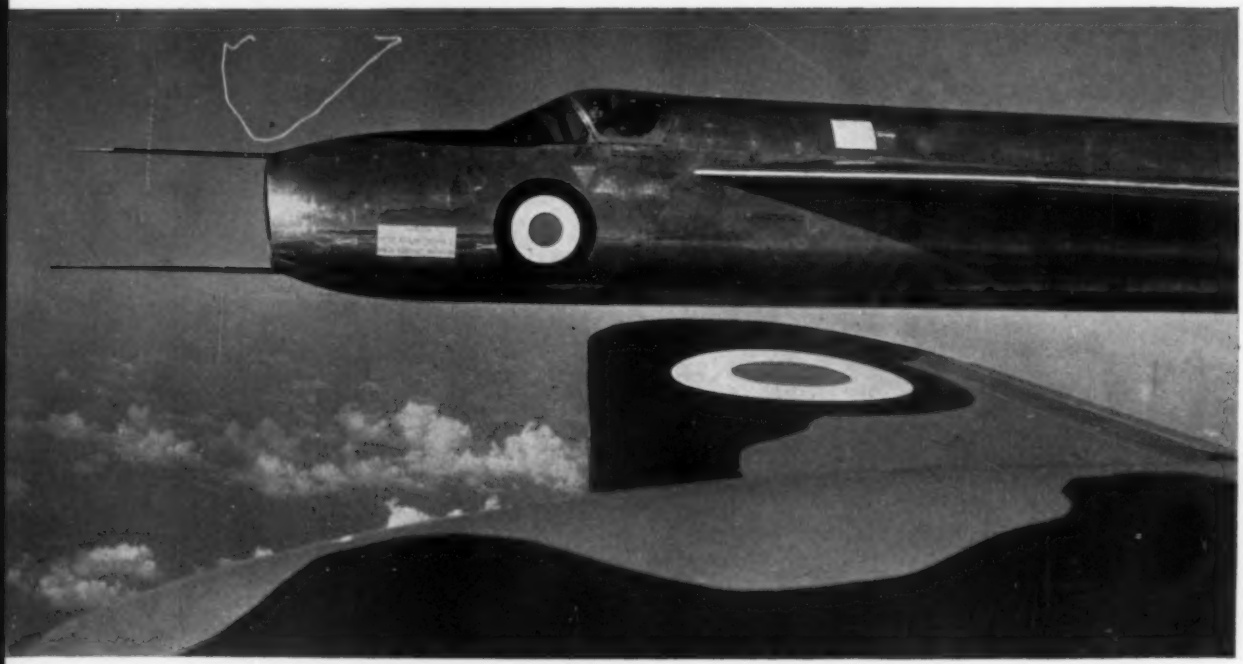




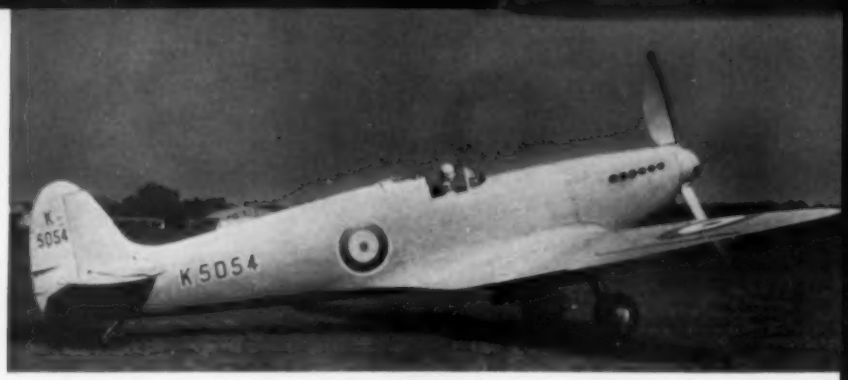
Although slab-sided and devoid of the smooth curves to which subsonic aircraft have accustomed us, the P1 has a bull-necked form suggestive of immense strength and ability. Above, it is starting to break away from the photographic machine in a roll off to the right, a manoeuvre which is fully developed in the picture on the left.

The small illustration on the right is one of the first to show the upper surface of the P.1. Its level is somewhat above that of the photographic Meteor and it is banking or turning to the left.

Though the photograph below is about a year and a half old, and when it was taken the P.1 was still very new, it is clear that "Bea" had no qualms as to its behaviour in tight formation. The Meteor was maintaining a very creditable air speed, but the eminently tractable P.1 is seen to be sauntering along at an appreciable angle of attack.



HERE AND THERE



SUPERMARINE ANNIVERSARY: The twentieth anniversary of the first flight of the first Supermarine Spitfire falls this week, for it was on March 5th, 1936, that the prototype K5054, seen in the "Flight" photograph above, took the air. From the Spitfire, through the Seafire, Spiteful, Seafang, Attacker, Types 510 and 535, Swift, and Types 508 and 525, the new N.113 Naval fighter (also shown here) has descended. Like every other Supermarine fighter since the first Spitfire, the N.113 is Rolls-Royce powered (two Avons).

Fireflash Discussed

AT a NATO conference on February 29th of military commanders and defence officials the possible use of the Fairey Fireflash air-to-air guided missile by NATO air forces was discussed.

Vampire Trainers for Eire

THE Irish Air Corps has placed an order for de Havilland Vampire Trainers, delivery to take place during the summer of this year. The Corps will thus become the twentieth air force to adopt this machine as standard equipment.

Seamew for Italy

A SHORT Seamew light anti-submarine aircraft is undertaking a demonstration flight to Italy. Flown by S/L. W. J. Runciman, it was due to leave Sydenham Airport, Northern Ireland, on Wednesday of this week, and after refuelling at Tangmere would fly to Rome *via* Cognac, Toulouse and Nice. Having reached Rome on March 12th, it will remain there for about a week for demonstration to the Italian Air Staff.

Sabres in Japan—

THE first squadron of Japanese jet fighters —North American F-86F Sabres—took the air a few days ago, just under two years since the Air Self-Defense Force was set up. Eight machines, all bearing the rising sun markings, took off from Tsuiki airfield, in Fukuoka Prefecture, Western Japan, and demonstrated over the base. All pilots were American trained and were veterans of the Pacific war.

—and Spain

AT a ceremony in Valencia on February 23rd the U.S. Ambassador to Spain, Mr. John Davis Hodge, handed over on behalf of his Government to the Spanish Air Minister, General Gonzalez Gallarza, the first 25 Sabres to be supplied under the terms of the U.S./Spanish military agreements. Spanish pilots are already fully trained to handle the Sabre, and Mr. Hodge said that the Spanish Air Force had its own programmes not only in the field of jet-propelled aircraft but also in technical research.

Dates to Note

FOR the information of many enquirers—this year's S.B.A.C. Show at Farnborough is fixed for September 3rd-9th. The last three days will, as usual, be "public" days.

Danish Pembrokes

A CONTRACT has been received by Hunting Percival Aircraft, Ltd., from the Danish Government for the supply of a number of Pembrokes to the Royal Danish Air Force. Delivery is scheduled for this year. As a variation of the ten-passenger layout a small number of the aircraft will be equipped as V.I.P. machines and will be luxuriously appointed for the accommodation of six passengers.

Belfast University Appointment

IT is announced that Professor Arthur V. Stephens, Professor of Aeronautics at Sydney University since 1940, has been appointed first holder of the new Chair of Aeronautical Engineering at Queen's University, Belfast. The decision to establish a chair in this field was taken early last year, following an offer by Short Brothers and Harland, Ltd., of substantial aid towards the capital cost.

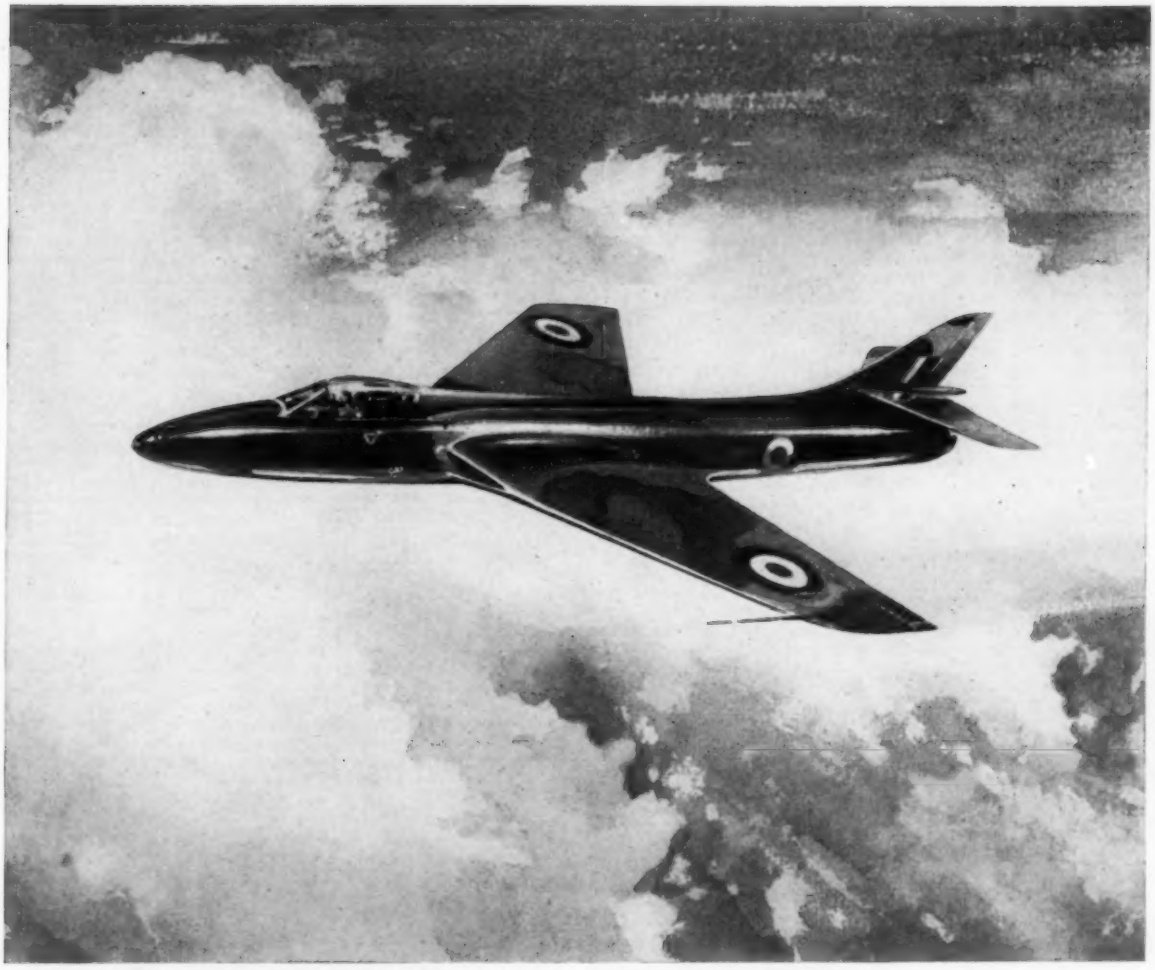
Polar Flight by Il-12

ON February 28th an Il-12 of the Soviet Antarctic expedition, flying from the Mirny base, made a ten-hour flight over the South Pole and back, a distance of some 2,000 miles. The purpose of the flight was to investigate the magnetic Pole area, where a second Soviet base will be established in July 1957.

Touring Show

AN enterprising bid to publicize French aircraft overseas was due to open this week with the departure of two Nord 2501 Noratlas transports from Paris for Australia, one of them carrying a S.O.1221 Djinn helicopter, and the other a Max Holste 1521 Broussard six-seat general-purpose aircraft. After giving demonstrations in Melbourne and Sydney and other Australian centres the aircraft are due to begin their return journey on March 29th and will be shown at a number of places in India and the Middle East. They are due back in Paris on April 30th.

WITH ITS SKATES ON: From its designer, W. J. Jakimiuk, comes this seasonable picture of one of the S.E. Baroudeur trolley-launched/skid-landing fighter/bombers. Three of these machines have been flying under conditions suggested by the picture and have so far been handled by eight pilots of the French Air Force Experimental Centre.



THE HAWKER HUNTER

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HERALDS FITTED WITH GOODYEAR TYRES, WHEELS AND BRAKES AS STANDARD EQUIPMENT

Once again, Goodyear has been chosen as standard equipment. This time for the new 'Heralds', being developed by Handley Page.

They have been designed to operate from large and small airfields, even those with a poor surface, and to be readily adaptable for passenger (a maximum of 44) or freight carrying, or to be able to carry both. Of vital importance to this all-round service will be the efficiency and durability of the aircraft equipment. That's why Handley Page have chosen Goodyear Single-Disc Brakes with their hydraulic control gear and Goodyear anti-skid system, as well as Goodyear wheels and tyres.

This type of equipment has been proved in service to be thoroughly reliable and to operate efficiently at low maintenance cost. It is because of this proved performance that more aircraft the world over land on Goodyear tyres, tubes, wheels and brakes than on any other kind.

Wheel unit supplied by Goodyear for the Handley Page Herald.

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THE MASEFIELD VIEW

—*of some Weighty Topics: Production, Training, Sales, Operations*

IN London recently Mr. Peter Masefield, managing director of Bristol Aircraft, Ltd., spoke his mind on problems now exercising the makers of today's big aircraft, and his own company in particular. His views, as always, command wide attention, and we report them here at some length.

His first concern was the severe shortage of technical staff and skilled production labour. For instance, Bristol Aircraft needed 500 draughtsmen and technicians for projects now in hand, and 500 skilled production engineers to work on the Britannia family of aircraft and on helicopters. The needs of the U.S.A. were being largely met by some 40 universities, and the Russians were understood to be profiting in the same way from Moscow University, among numerous other institutions. The Institute of Transport (of which Mr. Masefield is President) was giving increasing recognition to the problem and has been discussing with Oxford University the establishment of a readership in Transport which might later lead to a chair and to a syllabus for a degree course.

A study course, embracing such topics as economics, operations and air law, was planned under the aegis of the Royal Aeronautical Society for April 4th-18th next at Oxford, and the first nominees were six from Icelandic Airways.

Mr. Masefield said that the Institute of Transport was increasingly aware of the need for capital expenditure on all forms of British transport. He recognized present restrictions, but emphasized that short-term advantages must not be allowed to blind us to long-term necessities. New development and re-equipment programmes demanded a high capitalization rate if we were to get costs down.

These considerations brought him to the U.S. "spree of jet buying" (or "keeping up with the Joneses"). Present American commitments seemed to him beyond the "real economic prospects"; but we must not under-rate the Americans, and we were in for a period of major problems if we were to remain in "the big league," as he believed we must. The next five years would see Great Britain in or out as a major force in air transport production, and decisions had to be taken this year. Mr. Masefield thought we were right in having two major airlines and we should see more national lines, he thought, rather than fewer.

His short time at Bristol had suggested to him that the aircraft industry might afford to learn something from the precise planning which was the airline order of the day. (He drew the analogy of selling tickets at, say, £7 each to two million people and a one-million-pound product to twelve customers.) Certainly, "restless dissatisfaction" was needed. But things were progressing and the Britannia was coming along in a most encouraging way. As an illustration of the problems encountered in forward estimating he said that already 36 months' delivery was being quoted on many materials; so we had to know the precise specification of such materials if the future was to be defined.

The sixth Britannia had flown that morning (February 23rd). B.O.A.C. crews now had nearly 400 hours of Britannia training behind them, and seven machines should have been delivered to the Corporation by June. In July the Britannia should be on the Johannesburg run, and, by the autumn, on the Australia run also.

Mr. Masefield believed that the Britannia would be as successful as the Viscount—but its importance might not be recognized until passengers had sampled it in service. Bristol were determined that snags would be "jumped on," in token of which he mentioned the control stiffening problems in the recent cold spell, when operating forces on trimming tabs had increased from 5 lb to 16 lb. In the search for a cure, over a period of a week Britannias had been sprayed by a fire brigade for one to two hours each evening and had then been left out all night to freeze before flying. The final remedies—anti-condensation coils and a special grease —had enabled a Britannia to fly for 3 hours at −40 deg F at a height of 25,000-30,000ft; and the controls were "just as good as at the start."

There had been no significant engine troubles with the Britannia this year. Two aircraft had been flying up to 20 hours a day and making as many as 60 landings in the same period. As a type the Britannia was now backed by 3,050 hours' flying. Forty-nine Britannias had been sold and negotiations were in hand for the sale of 18-20 more; but the "big time for sales" should come some months after the type entered service. It was a machine with a maximum cruising speed of 409 m.p.h., a 28,000 lb payload, and a range of 6,000 miles at a reduced cruising speed of 360 m.p.h. Direct operating cost was below a penny per seat-mile. The company was now in a position to deliver Britannias to any new buyer at the rate of two a month from February 1958.

Of the Type 187 long-range turboprop airliner—proposed successor to the Britannia—Mr. Masefield said the investigation with Convair had brought complete technical agreement. The project was for an aircraft which would cruise at up to 480 m.p.h. with 130 passengers (payload 30,000 lb) for 6,000 miles, and would operate out of existing major airports without extension or strengthening of the runways. Compared with the new large pure-jet such a turboprop aircraft would be 25-30 per cent cheaper to operate.

Bristol's belief in the turboprop was unshaken, and Mr. Masefield named these six selling points: (1) low operating costs; (2) long range (e.g., London-San Francisco non-stop with high payload); (3) reasonably high cruising speed (up to 500 m.p.h.); (4) good runway performance; (5) low airport noise level (at London Airport the Britannia had proved quieter than anything except the Elizabethan); (6) great operational flexibility (from 15,000-40,000ft). The B.E.25 turboprop for which the aircraft was designed had no competitor: it was the only engine which could enable full payload to be lifted from any airfield irrespective of temperature or elevation.

On the helicopter side Bristol were pressing forward with twin-rotor machines, for which they looked eventually to turbine engines. There were hopes for an "enlarged" civil version of the military helicopter.

Indicative of Bristol's determination to recruit technical staff was their new design office in the Haymarket, London. The company were equally determined that its products should be backed by a better after-sales service than any hitherto offered by a British aircraft manufacturer.

G/C. TUDOR GOES TO BRISTOL

IT is announced that G/C. S. O. Tudor, D.F.C., who was until recently senior liaison officer with Folland Aircraft, Ltd., has joined Bristol Aero-Engines, Ltd. He is directly responsible to the chief engineer, Dr. S. G. Hooker, and his duties include liaison with the Services and with Government departments. G/C. Tudor, who is 48, was educated at Cranleigh and Exeter College, Oxford, where he took a degree in history. He learned to fly at Filton in a Bristol Lucifer in 1926, as a member of the Reserve of Air Force Officers. After working in India for four years, he returned in 1931 and joined the staff of the Automobile Association, eventually becoming its public relations officer. At the beginning of the war he completed an operational tour with Bomber Command and subsequently commanded No. 83 Squadron, at that time equipped with Lancasters. In 1942 he joined the staff of No. 5 Group, Bomber Command, and passed the R.A.F. Staff College course before returning to Group H.Q. Following a further period with the Group, he returned to the Staff College as a member of the directing staff, and in August 1944 was appointed R.A.F. representative to the United States Army and Navy Staff College. In 1945 he was appointed Group Captain Operations at R.A.F. H.Q. Burma. After demobilization G/C. Tudor returned to India as area representative for the S.B.A.C., and came home to take up the post of senior liaison officer with Folland in 1951.

PUTTING IN THE HOURS

THE Seattle flight test section of the Boeing Airplane Company announced recently that they had logged 4,039 hours in the air during 1955. At today's speeds, this time was equivalent to at least two million miles of flying. Of the total, 978 flights, adding up to 2,605 hours, were on purely experimental work; company officials say they believe this to be a record for any firm.

The major portion of the work involved the B-52, ten of which aircraft made 589 experimental flights, totalling 1,974 hr; other B-52s were tested from Seattle in the hands of U.S.A.F. crews. The Boeing 707 prototype made 222 flights, logging 268 hr.

OPERATION AFRICAN TOUR

No. 9 Squadron's Demonstrations During the Royal Visit: The Final Days

THE accompanying notes, based on dispatches from an Air Ministry officer who flew out to Nigeria, conclude the descriptions of No. 9 Squadron's Canberra demonstrations and other activities during the recent visit of the Queen and the Duke of Edinburgh to West Africa. Previous notes appeared in our issues of February 17th and 24th.

Kano, Nigeria, February 11th

The six Canberras of No. 9 Squadron experienced their first serious encounter with local flying and other conditions when they left here on Monday morning for their ceremonial fly-past over the airfield at Enugu shortly after the Queen and the Duke of Edinburgh were due to land there, from Jos, in a Heron of the Queen's Flight.

The E.T.A. of the Heron was 1200 hr (local) and the fly-past was scheduled for 1210 hr. Owing probably to low, unpredicted cloud in broken country, the Heron landed at 1207. Told by the ground controller that this was expected, S/L. L. G. Bastard (O.C. No. 9 Sqn., and leader of the Canberras) aimed to add ten minutes to the new E.T.A. and go over the airfield at 1217 hr. Letting down a high-speed formation of six Canberras through cloud, the base of which was lower than some of the high ground in the area, was a somewhat tricky business, but it was extremely well done and the squadron flew over at 1220 hr—only three minutes after their new scheduled time.

An additional fly-past for the Queen was arranged for Friday, February 10th, when she inspected the Apapa Wharf Extension at Lagos, about one hour's Canberra flying time from Kano. The time asked for was 1006 hr. Fifteen minutes before this the ground controller on the Wharf discussed with S/L. Bastard what should be done if the Royal schedule was behind or in advance. The squadron leader said he was then in a position to fly past at 1001 or any time later, but he emphasized that once a firm time was given the formation would not be able to come in earlier. At 1002 the controller said the programme was two minutes behind schedule and called for the fly-past at 1008. The leader reiterated that he could not bring the time forward. The formation was then orbiting some 20 miles west of Lagos. At 1006, with the Canberras on their final run in, the ground controller called for them to come in as quickly as possible. The formation stepped up speed from 250 to 320 kt and reached the saluting position on the new schedule of 1008. Their formation was said to be exemplary.

Serviceability remains excellent—so far no failure to take off on schedule or complete a mission has marred the Squadron's record.

On the social side, the Force has been invited to a number of cocktail parties and other gatherings. The Force Commander, A. V-M J. R. Whitley, the Deputy Force Commander, W/C. A. A. N. Nicholson, and S/L. Bastard had the honour of being received by the Emir of Kano in his medieval and resplendent palace; and this morning the Emir and his court (in about 20 limousines) arrived at the airfield to inspect the Canberras, preceded by a hornblower. Eight local notables were given Canberra flights in one morning by W/C. Nicholson.

Kano, February 17th

Perfect timing was achieved in the final fly-past for the Queen on February 11th at Ibadan, capital of the Eastern Region. The fly-past was timed for one minute after the Royal train drew into the station. The train was one minute late, and the six Canberras, led by S/L. Bastard, were called in to pass over the platform just 60 seconds afterwards.

Climax of the flying programme was yesterday, when the demonstration was given before a crowd estimated at about 100,000 at Kano—the largest number to have seen such a display on any of the overseas tours by Canberras. For over a mile the walls of the ancient city were closely packed, and the open space outside the walls provided a perfect setting.

The reactions of the vast crowd, said to be the biggest ever assembled at Kano, were once more of interest to experienced observers. They shouted their delight and clapped their hands, and the dust rose twenty feet as they stamped their feet to show appreciation of the rolls and high-speed runs of the two "individualists," S/L. Bastard and F/L. Thomas. The formation runs led by F/L. Hall again showed a high degree of flying skill and discipline.

Owing to the danger of low-flying vultures and hawks, the demonstration was given at 6 p.m. when it was expected that the fowls would run out of thermals and land. This, however, transpired to be somewhat optimistic. Three of the Canberras hit birds, to the disadvantage of their leading edges; but in only one instance was the damage serious and this was put right by the technicians the following morning. Two of these collisions had occurred near Sokoto, where the squadron demonstrated before the Kano display.

The last flying task before five of the Canberras and Hastings go to Freetown tomorrow is that of flying photographs of the Queen's visit from Kano to Lagos tonight. At Lagos they will be wired to London, there being no picture-wiring facilities at Kano. F/O. Peter Pratt, the pilot, and F/O. D. E. Kinsey will be making the first jet night take-off and landing in Nigeria, except for one previous landing by a Comet at Kano.

Freetown, Sierra Leone, February 19th

Officers and airmen who could be spared from duty had an excellent view of the Queen's arrival and departure from Kano airport on February 16th. Next day, A.V-M. Whitley was formally received at the palace of the Emir of Kano.

Freetown waterfront, between Cape Sierra Leone and Kissy Dockyard, proved another excellent demonstration point on Saturday morning. The Force Commander watched the display from Government House with the Governor, Sir Robert de Zouche Hall, K.C.M.G., and other officials. Lowish cloud and intense humidity caused the deletion of some of the more spectacular aerobatics, but it was a splendid show.

Most astonishment, however, was down on the waterfront. The principles of the functioning of the gas turbine are difficult to put across anywhere in West Africa, and here they brought some amusing repercussions. The Canberras had, by some strange freak, earned the name of "steam chickens". After S/L. Bastard had done several nice rolls, one admirer was heard to exclaim "That driver steam chicken, he savee plenty"; and, when Canberra 977 disappeared vertically into a cloud—"Steam chicken go for up".

Bathurst, The Gambia, February 21st

The Canberra-Hastings Force was re-united here yesterday with the arrival at Yundum airfield, 20 miles from the town, of the five Canberras and Hastings No. 1 from Freetown and the two Canberras and Hastings No. 2 which had been left at Kano (owing to lack of space and facilities at Lungi, Freetown).

The departure from Lungi was not without its moments of near-drama. As the Canberras unstuck, considerable pieces of the thin tarmac coating of the runway became temporarily airborne too. This caused some concern to F/L. "Jock" Graham, captain of Hastings No. 1 (who took over command of No. 24 (Commonwealth) Squadron detachment after the departure for the U.K. of S/L. R. B. Bolt), as he and the ground staff had still to use the runway. The runway itself, however, was found to be quite usable; but it was then found that the blast from the Canberras had rolled back like a carpet several feet of the P.S.P. surface at the landward end of the runway. The airport authorities rapidly got into action, and what appeared to be several hundred Africans were rushed in five lorries from their labours at the other end of the runway, which is under repair, to re-lay the P.S.P. The result was that Hastings got away to its E.T.D.

The four hundred miles between here and Freetown saw a remarkable change in the weather. Refreshing Atlantic winds have made the temperature like the best of English summers and humidity is negligible. The Force, mindful of the terrible weather reports from home, were thankful for this gentle return to sterner climes. Gibraltar is said to be many degrees cooler than usual.

The Governor of The Gambia, Sir Percy Wyn Harris, in the cool of last evening invited the officers of the Force to cocktails in the delightful gardens of his Residence.

Conditions were ideal for this morning's demonstration off the waterfront. The Governor and the Force Commander, A. V-M. Whitley, along with the senior Ministers, watched from Government Wharf, and on the jetties and beaches behind and flanking it was literally all the population of Bathurst and thousands who had come to town from the river territories. The flying was as ideal as the weather. No. 9 Squadron has never done better.

The smallest of the colonies visited, The Gambia, has opened its heart and its homes certainly no less generously than any of its bigger and wealthier West African neighbours. Those due to leave here on the long haul to Gibraltar at dawn tomorrow in Hastings No. 1 are envying those going by Canberra and Hastings No. 2 on Thursday.

Today's was the last of the demonstrations. The Force is proud that every scheduled mission has been flown on time; in view of the conditions this 100 per cent record is indeed a fine one.

Search *Strike!*

NO OTHER ANTI-SUBMARINE AIRCRAFT IS SO compact, efficient and economical as the Gannet. Combining in a single aircraft ability to search and strike with the most formidable modern weapons, it is in squadron service NOW with the Royal Navy at sea, offering continuous mid-ocean protection for convoys. From shore bases the Gannet is equally effective, combining exceptional range with exceptional striking power.

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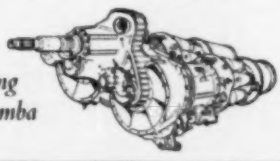

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(de Havilland Goblin Engine)

for the Royal Air Force College, Cranwell

DE HAVILLAND

Of these two Boeing B-47 variants, the upper is the new RB-47K dual-purpose machine, subject of a paragraph on this page, and the lower is the second XB-47D flying test-bed, powered with two Wright T49 turboprops inboard and two General Electric J47s outboard.

AIRCRAFT INTELLIGENCE

U.S.A.

Supersonic Bombers. Reported designation of a projected Boeing supersonic bomber is Project 110. "New chemical fuels" are mentioned in connection with this machine. According to *Aviation Week*, the Pentagon is "taking a new look" at the Convair B-58 Hustler supersonic bomber programme now that it appears almost certain that the design competition for a new tactical bomber will be cancelled. Teams from Tactical Air Command have been visiting Convair's Fort Worth plant inspecting the B-58 mock-up and prototype under construction.

Boeing RB-47K. The RB-47K version of the Stratojet has been specially modified for Strategic Air Command to undertake both weather reconnaissance and photography. The crew, as in other Stratojets, numbers three. Special equipment measures and records wind velocities and directions, moisture, temperatures and barometric pressures, and to maintain a permanent record the weather instruments—located on a single panel in the nose—are photographed at regular intervals. Data can be correlated with cloud photographs (also taken at regular intervals) for predictions of weather, or under certain circumstances can be relayed to base immediately. Additionally the RB-47K can undertake high- or low-altitude photographic missions by day or night.

Bell H-13H. A contract has been received from the U.S. Army for 84 H-13H helicopters equipped with stretcher evacuation kits, two radios, dual controls, and fitted with a new design of skid landing gear and all-metal rotor blades. The engines are 250 h.p. Lycomings, de-rated to 200 h.p.

Lockheed XFV-1 Salmon. This V.T.O. project has now been definitely shelved because of difficulties with the power plant. Work on the generally similar Convair XFY-1 and the pure-jet Ryan Model 69 projects is proceeding.

Canada

D.H.C.A Twin Otter. This high-wing twin-engined, big brother of the Otter is likely to have two Pratt and Whitney Twin Wasp engines, though it will be somewhat smaller than the Dakota. Maximum load is reported to be 28 passengers for short hauls, but the machine will retain the Otter's astonishing short-field characteristics.

Boeing B-47B Test-bed. The U.S.A.F. has loaned the R.C.A.F. a B-47B Stratojet for use as a flying test-bed for the new large turbojet being developed by Orenda Engines, Ltd. The machine will be converted at Canadair's Cartierville plant and is likely to be retained by the R.C.A.F. for about two years. The engine-development test flights will be made by Mike Cooper-Slipper, who will be checked out on B-47s at Wichita later this year.

France

S.N.C.A.S.O. Vautour. Quantity production of the twin-jet Vautour is involving more than 300 sub-contracting firms, including S.N.C.A.N., S.N.C.A.S.E., S.F.E.R.M.A., Marcel Dassault, Bréguet and Ratier. The contribution by S.N.C.A.S.O. itself represents only about 25 per cent of the total value of the order.

DOUGLAS C-133A
(Four Pratt and Whitney T34-P-3)

Span	179ft 8in
Length	152ft 8in

EAGLE'S TALONS

Wyverns of Nos. 830 and 831 Squadrons, Fleet Air Arm, Work-up at Ford

TWO squadrons of Wyvern strike aircraft are now working up at Royal Naval Air Station Ford, in Sussex, preparatory to going aboard H.M.S. *Eagle* in April for a tour of duty in the Mediterranean. They are Nos. 830 and 831, both of which were reformed last November for the first time since World War 2. Preparations for carrier flying are going well, and many and various types of operation have already been practised. The pilots, most of whom had not flown Wyverns before, and some of whom have never previously served with an operational squadron, have taken a liking to the Westland product, as well they might, for the Wyvern is something of an achievement. Certainly, it is unique in being the only turboprop strike aircraft to go into service with any navy and represents a tremendous development effort on the part of both airframe and engine manufacturers. It has now proved itself during three years of Naval service.

The ground crews of the two new squadrons are now getting the feel of servicing the aircraft; and, for a recent *Flight* visit to Ford, the units put up a formation of twelve Wyverns for photography. Not satisfied with this, they then each got a further division of four aircraft into the air for other pictures. One aircraft was also armed-up with 16 rockets and flown for the camera. That the pilots of the Wyverns and of the Vampire trainers which were used by the cameraman did their work well is shown by the pictures accompanying this article.

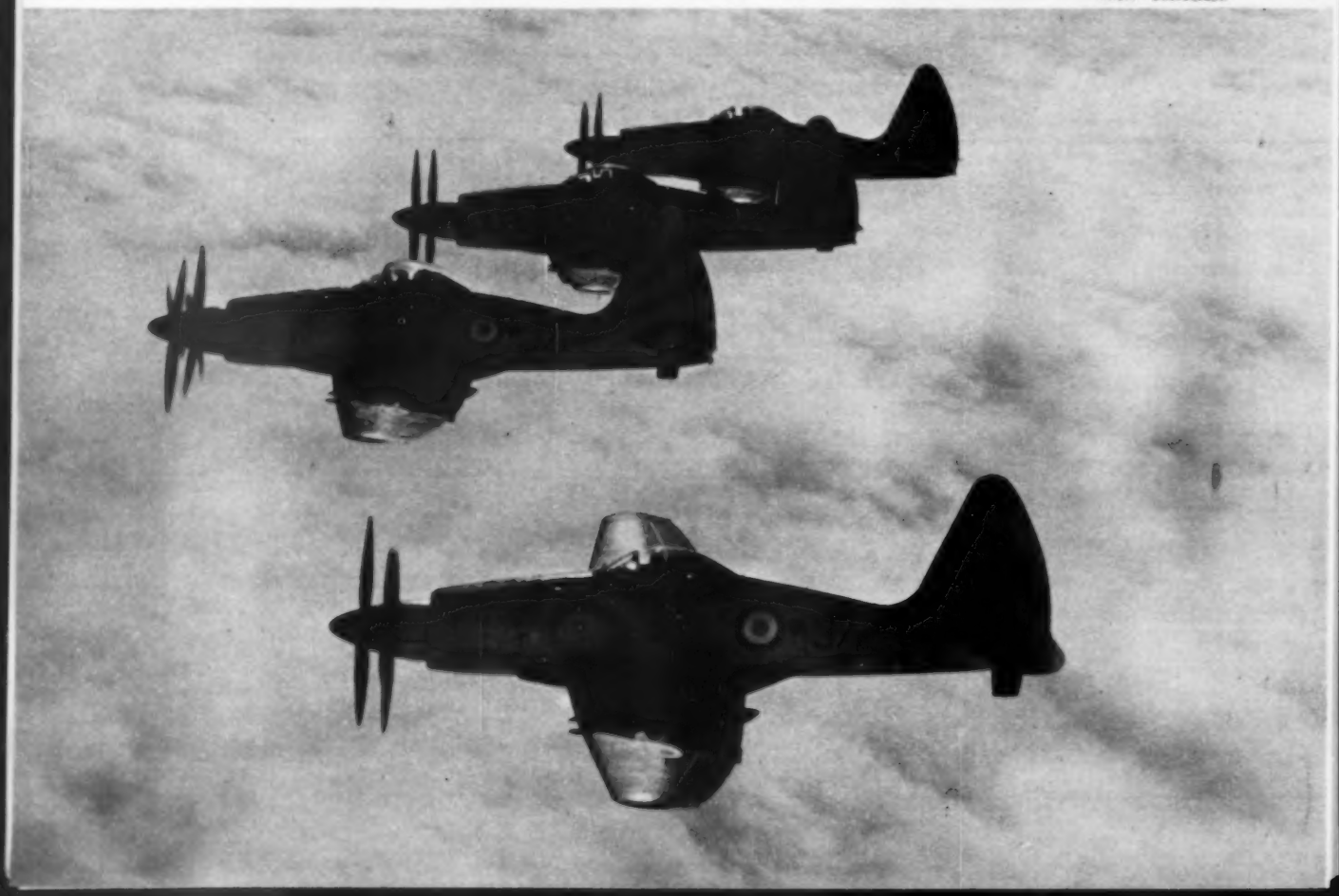
No. 830 Sqn, incidentally, are wondering what their early history was, since they know only that they were first formed in Malta in 1942 and largely manned by New Zealand personnel. The squadron badge in fact commemorates the connection with the island by the inclusion of the Maltese cross. The unit was disbanded at the end of World War 2, probably while still overseas—records appear to have been lost. No. 831 Sqn. is more fortunate; a complete historical record of its war-time career is available.

No. 830's Commanding Officer and senior pilot are, respectively, Lt-Cdr. C. V. Howard and Lt-Cdr. W. H. Cowling and the air engineer officer is Lt. J. H. Dunphy. The C.O. and the senior pilot each led a division in the large formation depicted on page 266 and were accompanied by Sub-Lt. P. A. McKern, Sub-Lt. J. Webster and Sub-Lt. R. King. One aircraft went u/s. and was replaced by a machine from No. 831, flown by Sub-Lt. R. E. Sandison. No. 830's second formation was flown by Lt. G. W. Barras, Sub-Lt. A. C. Parsons, Lt. J. P. Smith and Sub-Lt. B. Scott. No. 831 Squadron's contribution to the "Balbo" was led by the C.O., Lt-Cdr. S. C. Farquhar, and the senior pilot, Lt-Cdr. W. A. Tofts. They were accompanied by Sub-Lt. M. J. Doust, Lt. A. Gray, Lt. R. C. Hunt and Lt. P. Wheatley. This squadron's second formation was led by the C.O. and included Lt. Doust, Sub-Lt. A. M. Steers and Lt. J. T. Spafford. The rocket-armed aircraft was flown by Lt. Wheatley. No. 831's air engineer officer is Lt. A. J. Bastick.

Even by present-day standards the Wyvern is a hefty single-

Three Wyverns from No. 830 Sqn. and one from No. 831 in "finger-four" over a sunny cloud-top near their base at Ford. The pilots are Lt-Cdr. C. V. Howard, leading, with Sub-Lt. P. A. McKern, Sub-Lt. R. E. Sandison (No. 831 Sqn.) and Sub-Lt. J. Webster in the No. 2, 3 and 4 positions respectively.

"Flight" photograph



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EAGLE'S TALONS . . .

A rocket-laden Wyvern, flown by Lt. P. Wheatley of No. 831 Sqn. flies past the photographer's Vampire T.22 with air-brakes extended at the trailing edge and under the wing. The new air brakes are very powerful.

"Flight" photograph

seater. But, on the score of size it has this to be said for it: the cockpit is perched very high in the top of the fuselage so that the pilot does not notice the full size of the aircraft except by the feel of it on the controls. The tail-down attitude on the ground is not pronounced and the 3,650 e.h.p. Python is so cowled that it obscures a ground area ahead of the nose measuring only some 30 yd by 10 yd. There is no need to weave while taxying. The after fuselage is capacious, and one almost expects to see the faces of extra crewmen peering from the lateral camera port. The structure, engine and equipment of the Wyvern, to a maximum weight of well over 20,000 lb, are sustained in flight by a high-speed wing of pleasing elliptical plan form; and the whole can be hurled accurately onto the deck of a carrier with comparative equanimity.

One's first thought on seeing an aircraft of this type is always "what is it like to fly?", and during our visit we lost no time in putting the question to a number of the pilots. They liked the machine and considered it an excellent weapons-platform. In the three months since forming, both squadrons have done a good deal of flying and have successfully practised the majority of the different types of operation for which the Wyvern is suitable. Curiously enough, one of these operations is artillery spotting, and it has actually been carried out in support of army 25-pounder field guns firing on the ranges at Larkhill, on Salisbury Plain. Another task is tactical reconnaissance, involving the location and photographing of ground targets. For this the Wyvern is equipped with four camera ports, two on the centre line under the fuselage, aft of the trailing edge, and two more high in the sides. It is from one of these oblique installations that a Wyvern pilot secured an excellent picture of the Man of Cerne Abbas, that well-known pinpoint for cross-country fliers. For artillery spotting, squadrons work in conjunction with the Royal Marine carrier-borne ground-liaison unit which will accompany them at sea in *Eagle*. For strike sorties the Wyvern uses its fixed armament of four 20mm Hispano cannon augmented either by sixteen 60 lb rockets or a selection of bombs.

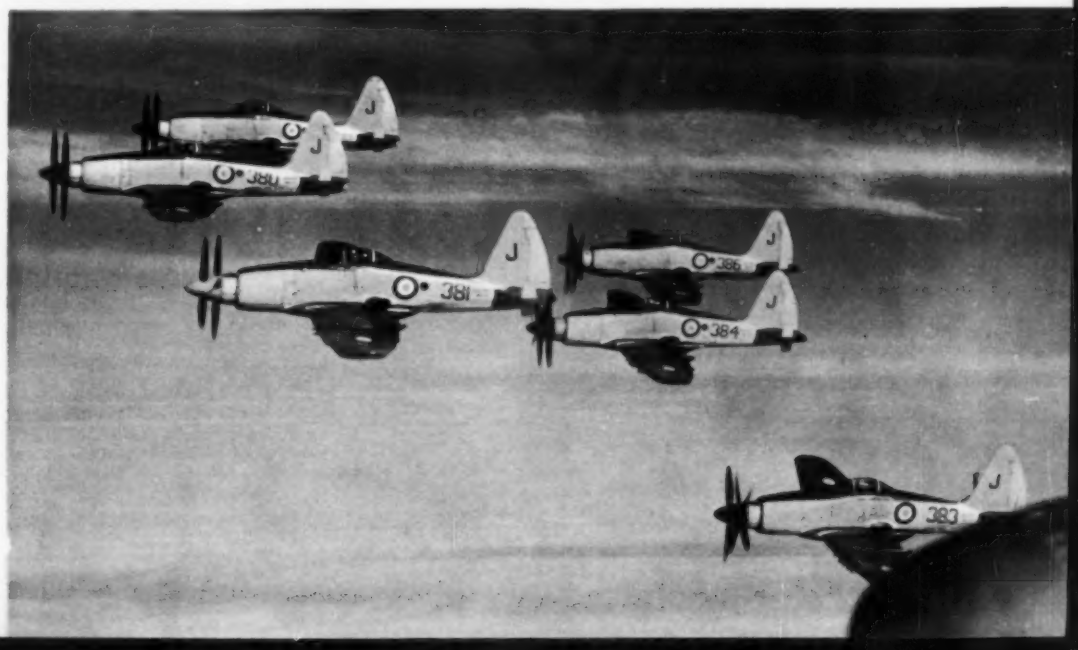
Navigation over sea is assisted by an A.P.I. used in conjunction with a plotting board, G.4.B compass, radio altimeter, contacting pressure-altimeter and the usual facilities available through V.H.F. radio. Practice searches and strikes are carried out against most Naval vessels on passage through the Channel.

The Wyvern's main undercarriage is a massive unit, and it gives excellent shock-absorption which is particularly useful in view of the landing technique described later. The brakes, too, of the pneumatic-bag-operated drum type, are reported to be very effective. All three undercarriage units are retractable and the large mainwheel doors are pre-closing.

Each inner wing panel carries an extending aerofoil-section flap which swings downwards and rearwards initially and droops in the final stage of movement, while each outer wing panel has a short-span simple flap. Although any degree of flap can be selected on the operating lever, there are three main positions; "manœuvre" when the inner flap extends partly; "take-off," when the inner flap extends fully and the outer surface droops fully; and "landing," when the inner surface droops from the fully extended position. The outer flap has only two positions.

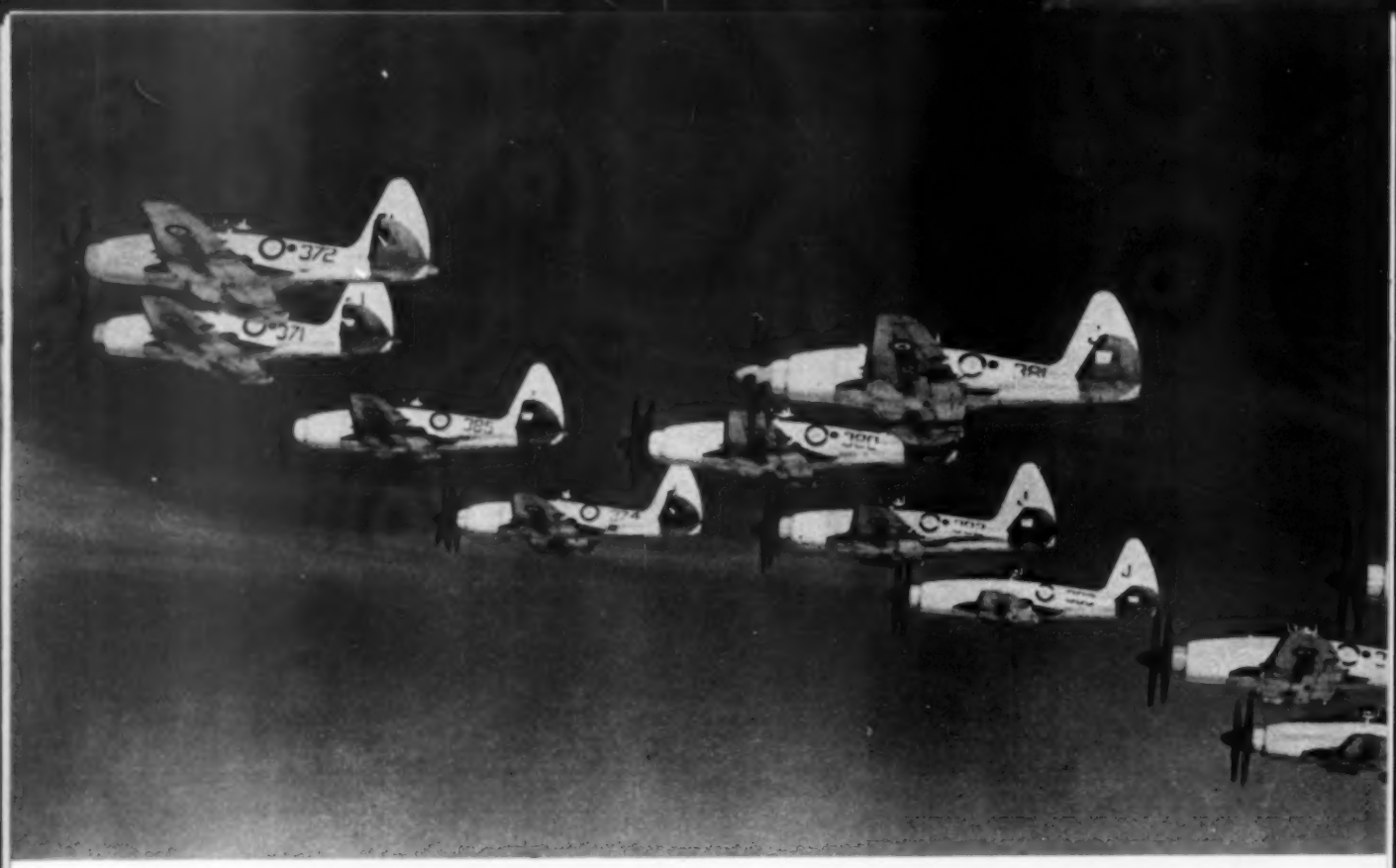
Pulling the air-brake trigger of early models of Wyvern lowered the outer flap and raised a reversed flap on the wing's upper surface, but now an extra perforated-plank brake has been added under the inner wing at about 50 per cent chord; the combination of all three surfaces has proved to be extremely effective, although a certain amount of buffeting occurs.

The four Hispano cannon are mounted well back in the wing so that only a few inches of barrel project beyond the leading edge. Links and cases of expended rounds are dropped through plain



No. 831 Squadron's aircraft turn in close formation of vics, line astern. The letter "J" on the fins is the distinguishing letter of H.M.S. "Eagle," in which the unit will embark in April. The Vampire Trainer's wing tank intrudes at right.

"Flight" photograph



EAGLE'S TALONS . . .

slots in the wing's under-surface. Fuel is carried in the outer and inner wing panels and in the fuselage, giving an endurance sufficient for a formation to fly comfortably from Ford to Lossiemouth. Such a flight would be made in about 2 hours, cruising at the Wyvern's comfortable operating ceiling of about 20,000ft. The tanks in the wing are pressure-refuelled with the wings folded through connections located at the root ribs each side of the hinge line.

One of several new features of the Wyvern is the redesigned cockpit enclosure, which includes a flat windscreen equipped with a wiper, and a new metal-framed plastic canopy with an all-metal rear section. Hot-air demisting is provided for the screen. The Wyvern must be almost the only airscrew-driven aircraft in the world now in service with an ejector seat and this is, of course, a Martin-Baker Mk 2 with all automatic facilities. The cockpit as a whole is neither heated nor pressurized, although a certain amount of warmth is derived from the jet-pipe passing on each side. Oxygen is breathed at all times.

Pilots normally wear immersion suits while flying and, since these and the long underwear which must accompany them take some time to put on, the crews dress up in the morning and spend the whole flying day in dispersal without returning to the mess. Meals are served in dispersals. The immersion suits are in two parts, the trouser section carrying integral rubber boots and being sealed to the upper part by a rolled rubber sleeve. The material of which the suits are made is porous when dry, to allow normal ventilation, but seals up immediately on immersion in water.

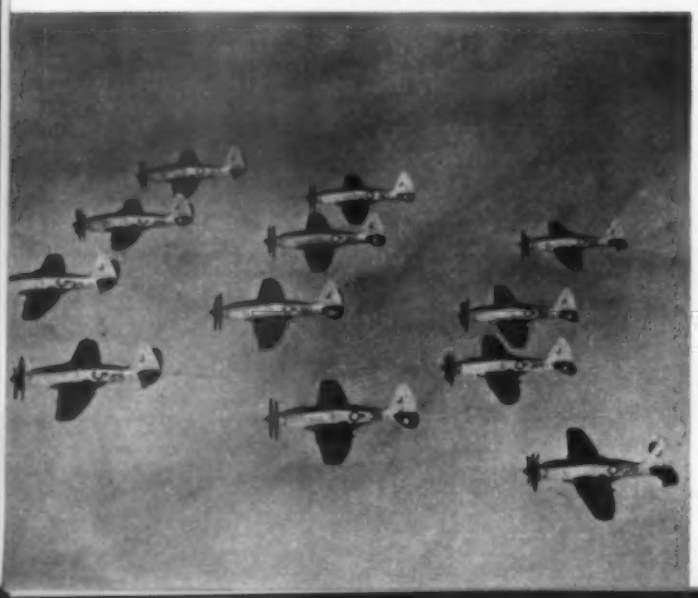
There is plenty of room in the Wyvern cockpit and, as stated before, visibility is excellent. The Python is started with the aid of 3,600 lb/sq in compressed air supplied from a trolley. Cartridge starting will be introduced later. All the pilot has to do is switch on the batteries, open the H.P. cock and press the igniter switch until the engine reaches its self-sustaining speed of 2,500 r.p.m.; at this point he signals for the compressed-air supply to be cut off, trips the igniter switch and the main burners cut in to take the engine to its ground-idling speed of 4,500 r.p.m. A number of starting malfunctions might occur in this, as in any other engine, but they could be countered simply by closing the H.P. cock and starting again.

For directional control during taxying, differential brake is used exclusively, since the tailwheel can only be set fully free or locked central and the rudder does not become effective until high engine powers are used. Take-off was reported to be perfectly straightforward, with strong acceleration and hardly any swing. Rudder control is soon gained, the tail rises of its own accord and the aircraft flies itself off at 95 to 100 kt after a short ground-run. Once the Wyvern is off the ground and cleaned up, it accelerates well to its cruising speed, and soon shows good stability and pleasant handling. The ailerons have spring tabs and sealed mass-balances and give a good rate of roll; aerobatics are restricted to those not involving negative g.

Pilots reported that 250 kt is a comfortable speed for normal handling and that during the dive for a gun or rocket attack the aircraft was steady and comfortable and pulled out of the dive well. There is a mechanically-actuated trim tab on the elevator and electrically-operated tabs on rudder and ailerons. In a prolonged dive at high speed, right rudder is required in order to keep straight. At the lower indicated speeds the Wyvern's wing-loading of about 65 lb/sq ft begins to make itself felt and the aircraft cannot be treated in turns without a reasonable degree of care; this, of course, holds good for any fairly large and fast aeroplane.

The most unusual feature of the Wyvern from the new pilot's point of view is the large turboprop. Because of the particular requirements of carrier operation, the engine is maintained at constant speed. The r.p.m. dial, so much used as a reference instrument in other types of aircraft is, in the Wyvern, merely

Seen here from a higher viewpoint, the formation above becomes apparent as one of "finger four, sections line astern."



(Left) The "Balbo" of 12 Wyverns put up for "Flight's" camera by Nos. 830 and 831 Sqns. from Ford. (Below) Lt. Wheatley's load of sixteen rockets presented at really close quarters for the cameraman in the Vampire T.22.

"FLIGHT" photographs

a means of checking that the Python is in fact constant-speeding at its required 7,800 r.p.m. The actual power delivery is gauged from a torquemeter. Whereas a pilot usually judges his engine's power-delivery approximately by the noise it makes, the constant-speed Python gives no such indication of power output, nor must the power lever, for obvious reasons, be roughly handled. During a circuit and approach, therefore, engine handling is very different from that of piston-engined or pure-jet aircraft. At 170 kt, flaps and undercarriage can be lowered and speed then reduced for a mirror landing to 135 kt, dropping to 100 kt "over the hedge." The technique for landing is to use a modified "no-cut" procedure; that is, the aircraft is brought in, properly lined up, in the landing attitude at a fairly high power setting and allowed to touch down on all three points without a round-out. At approach speeds the stick should not be brought back to decrease the rate of descent—such action, in fact, is liable to increase the rate of descent very considerably. The aircraft is controlled by adjustments of power and a "wheeler" landing is never attempted. Apparently the rate of descent just before touch-down appears a little excessive at first, but in fact the touch-down is not heavy and the undercarriage prevents any bounce. The pilots report that the sensitive twin-pointer A.S.I. can be read to within a knot or two at the lower speeds and is a great help in making a correct approach.

It was said that the Wyvern had to be put on the deck correctly and would not allow itself to be pushed into the wires in the same way as, for example, the Sea Hawk or Gannet which have the nosewheel undercarriage. But the squadrons expect no trouble from deck landing when they join *Eagle* in April. It is noteworthy that for a number of pilots the Wyvern was their first operational aircraft. Some had been trained in England on the Provost/Vampire Trainer scheme and had then completed a Wyvern ground-school course before flying the aircraft for the first time; others had been trained by the U.S. Navy, first on Harvards (SNJs), then on Shooting Star trainers (TV-2s) and finally on Panthers (F9F-5s). After a tour on Wyverns they will have behind them experience which must for long remain unique in the Services of the world—and a good grounding in the handling of large and fast turboprop combat aircraft.

C.M.L.

STRATEGIC FIGHTER

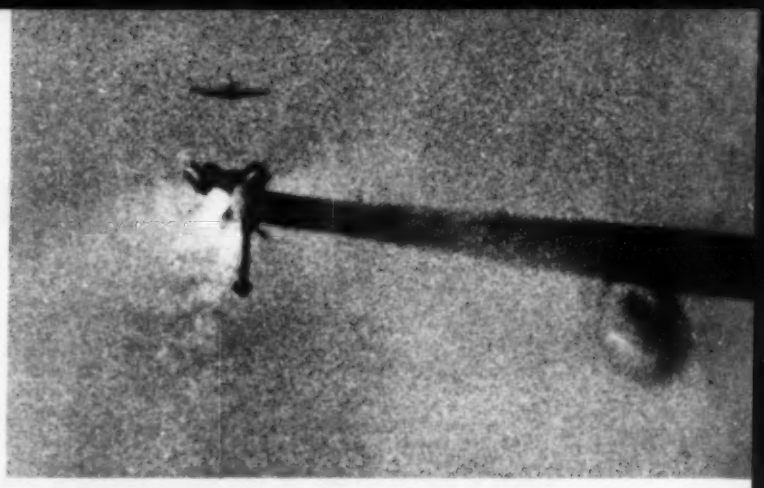
HEAVIEST and most powerful single-seat aeroplane ever put into production, the McDonnell F-101 Voodoo is rapidly approaching the stage at which batches will be released to the U.S.A.F. The design grew out of the XF-88, which was classed as a "penetration fighter" (i.e., it was designed to fly far into enemy territory), whereas the F-101A is described as a "strategic fighter" (which means virtually the same thing) and, into the bargain, can carry atomic weapons.

The photograph above indicates a broadening of the Voodoo's scope, for this aircraft (the 19th pre-production machine, excluding RF-101As) is carrying armament usually associated with interceptors—three GAR-98 Falcon active-homing missiles and two packs each of half-a-dozen spin-stabilized air-to-air rockets. Basic armament of four 20mm M-39 cannon is, apparently, retained, as indicated in the detail sketch below. Deliveries are also to be made of RF-101As (*Flight*, November 4th last, p. 701) in which a very comprehensive, and fully automatic, camera installation is housed in an extended nose. Exceptionally clear pictures have been taken by these aircraft at over 45,000ft and at speeds in excess of Mach 1 (maximum speed of most 101s is over 1,100 m.p.h. or M = 1.65).

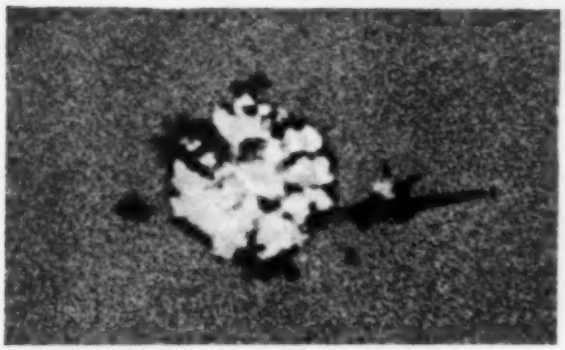
All F-101s are at present powered by Pratt and Whitney J57s with afterburners (J57-13, built by P. and W. or Ford), providing up to 32,000 lb of thrust. This is, however, still considerably less than the gross weight of the aircraft, and, as the wing span is less than 40ft the wing loading is well over 100 lb/sq ft. To some extent this is countered by employing blown flaps, which markedly raise the maximum lift coefficient. Provision is made for probe/drogue and pod/boom in-flight refuelling.

FIREFLASH IN ACTION

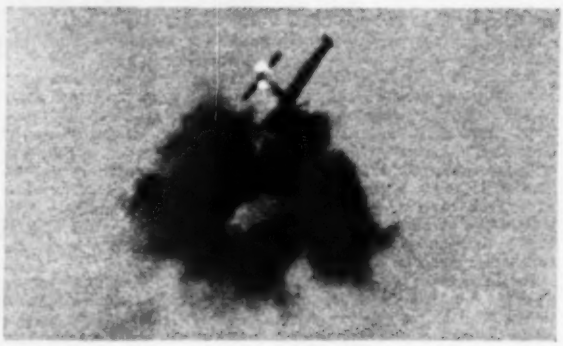
WE are now permitted to publish a series of photographs taken from a ciné film recording a test firing of Fireflash, the air-to-air guided missile developed by the weapons division of the Fairey Aviation Co., Ltd. (Introductory notes on this missile were published in our issue dated February 24th.) Owing to the fact that these illustrations are very greatly enlarged from 35mm frames the grain size is apparent and definition is considerably less than perfect. None the less, they are the first to illustrate the firing of a British missile from an aircraft—with the exception of the bottom photograph, which is explained in its caption.



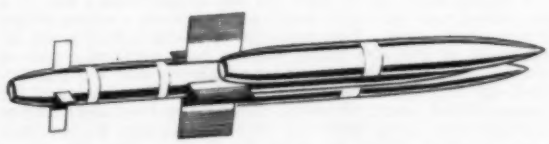
1 *Fireflash is here being launched from the tip of an N.F. Meteor wing (note drop tank). There appear to be two boosters firing, one being above, and slightly outboard of, the other. Cruciform wings and control surfaces are disposed in diagonal planes. Foreshortening caused by enlargement makes the target appear much nearer than it really is.*



2 *Triggered by its proximity fuse, the Fireflash warhead explodes at the appropriate distance from its quarry, a Fairey Firefly 8 radio-controlled drone. Owing to the fact that the burst is almost in line with the target, it is difficult to assess the distance at which the fuse functions, but it seems to be at least 20ft.*



3 *Presumably from the same film, this view shows the Firefly beginning to heel over—possibly as a result of partial destruction of the port wing. No portions of missile or target can be seen in the vicinity, neither is there any evidence of the missile having left a trail of smoke. The drone was actually on fire at this point.*



The photograph on the left, although first published by us in August 1953, and not officially connected in any way with the other illustrations on this page, is reproduced here by reason of the obvious similarity between the two firings. The sketch above, prepared from the same photograph, clarifies the apparent geometry of the missile.

FORTHCOMING EVENTS

Mar. 9. Helicopter Association: "Helicopter Operations in the Persian Gulf," by A. E. Bristow.
Mar. 12. Institute of Transport: "Application of Atomic Energy to Transport," by Sir John Cockcroft, K.C.B., C.B.E., F.R.S.
Mar. 14. Kronfeld Club: "The Kites, Gliders and Aeroplanes of Col. S. F. Cody," by G. A. Broomfield.
Mar. 15. R.Ae.S.: Main Lecture: "The High Temperature Turbojet Engine," by D. G. Ainley, A.F.R.Ae.S.
Mar. 16. British Gliding Association: Annual Ball.
Mar. 17. British Gliding Association: Annual General Meeting.
Mar. 17. British Interplanetary Society: "Space Ship Construction," by A. M. Kunesch.
Mar. 17. British Interplanetary Society (Manchester): "Aerodynamic Drag," by R. J. Boor.
Mar. 20. R.Ae.S.: Section Lecture: "Experiments on Flow Over Swept Back Wings," by P. T. Fink, B.E., A.F.R.Ae.S.
Mar. 21. R.Ae.S.: First Chadwick Memorial Lecture: "The Life and Work of Roy Chadwick," by H. Rogerson, M.B.E., F.R.Ae.S. (Main lecture, in Manchester.)
Mar. 21. Institute of Navigation: "Developments of the Decca Navigator System"—papers by Capt. B. Wright, G. Hawker and J. G. Adam.
Mar. 21. Kronfeld Club: Film Show.
Mar. 22. R.Ae.C.: Film Show.
Mar. 24. British Interplanetary Society (Bristol): "Mars," by P. Moore, F.R.A.S.
Mar. 27. R.Ae.C.: Annual General Meeting.
Mar. 27. R.Ae.S.: Section Lecture: "Aircraft in Pest Control Agriculture," by J. E. Harper.
Mar. 28. R.Ae.S.: Graduates' and Students' Section: "Artificial Space Satellites," by A. V. Cleaver.
Mar. 28. British Interplanetary Society: "Space-ship Engineering," by P. H. Tanner, B.Sc.
Mar. 28. British Institution of Radio Engineers: "Problems of Secondary Surveillance Radar," by K. E. Harris.

R.Ae.S. Branch Fixtures (to March 22):—
Mar. 12, *Halton*, junior members' paper; *Henlow*, "Domain of the Helicopter," by R. Hafner. Mar. 14, *Southampton*, "Airframe Fatigue," by W. Tye; *Weybridge*, "Control of Welding in Aircraft Production," by H. E. Dixon. Mar. 16, *Birmingham*, "Wheel and Brake Development and Testing," by P. W. Dryland. Mar. 19, *Halton* "Aerial Surveys," by H. G. Dawe. Mar. 20, *Belfast*, "Radio Aids to Navigation," by H. H. Capes. Mar. 21, *Chester*, "Fuels and Lubricants for Jet Engines," by K. C. Hunt; *Gloucester*, lecture; *Manchester*, main lecture (see above); *Preston*, "Advantages and Disadvantages of Swept Wings," by Dr. D. Küchemann; *Reading and District*, "Maintenance Aspects of Viscount Operation," by E. R. Major. Mar. 22, *Isle of Wight*, "Development of Gas Turbine Engines," by Dr. S. G. Hooker.

A British Gliding Pioneer

The Experiments of Percy Pilcher

By PETER W. BROOKS

Percy Sinclair Pilcher.

EARLY in 1952, an old gentleman who had been up to London to attend the funeral of King George VI died on a railway platform on his way home to Northamptonshire. The death of Adrian Verney Verney-Cave, the sixth Baron Braye, attracted little attention; yet his passing severed a final link with the earliest days of successful human flight. Lord Braye, in his youth, had been a friend of Percy Pilcher, the first man to fly a glider in this country and one who, but for his death in 1899 as a result of a gliding accident on the Braye estate, might have become the first man in the world to achieve successful powered flight.

Percy Sinclair Pilcher was born in January 1866. He joined the *Britannia* at the age of thirteen to train for a life in the Navy, but left that Service in 1885 and turned his attention to engineering as a career. After studying at London University, he became an assistant lecturer in naval architecture and marine engineering at Glasgow University in 1893.

From early youth, Pilcher took a close interest in the flight of birds and in the possibilities of mechanical flight. In 1891 he first heard of the gliding experiments which the great pioneer Otto Lilienthal was then making in Germany but it was not until early in 1895 that he started constructing his first glider in his spare time, modelling it largely on photographs in the Press of Lilienthal's machine. This glider, which was called the Bat, was without a tailplane but had a fixed rear fin. The wings had an area of 151 sq ft and pronounced dihedral. The glider weighed 55 lb, was built of Riga pine covered with nainsook fabric and was of the "hanging" type, in the Lilienthal tradition. That is to say, the pilot was suspended from the centre section and controlled the machine by swinging his body.

In June, 1895, before flying the Bat, Pilcher went to Germany to see Lilienthal and watch him fly his glider. On his return to England in July he made a number of unsuccessful attempts to fly the Bat in its original form before modifying it in the light of what he had learnt in Germany. After adding a tailplane and reducing the dihedral of the wings, Pilcher succeeded, on September 12th, 1895, in making the first controlled flight ever made in the British Isles. It lasted 20 seconds, during which a little height was gained in the slope-lift of the hill where Pilcher was making his experiments—at Wallacetown Farm, near Cardross on the North bank of the Clyde.

A second flight on the same day was started from a tow by a man with a rope and lasted nearly a minute from a release height of about twenty feet. This technique of towed launching was an innovation of Pilcher's which had not been previously used in practice, although it had first been suggested—and was possibly tried—by that other great British pioneer of aeronautics, Sir George Cayley, nearly fifty years earlier. Many successful flights followed these initial trials and later that summer Pilcher built a second glider which he called the Beetle. This also was a "hanging" glider, but the wing was without dihedral and was mounted above the pilot so as to keep the wing-tips off the ground. Pilcher had had trouble from catching the Bat's wings on the ground during landings. In the event, the Beetle did not prove as successful as its predecessor, because of too great a weight and too low a centre of gravity. The Beetle was made stronger than the Bat so as to be suitable for the installation of an engine and propeller which Pilcher was contemplating. This greater strength increased the weight to 79 lb for an area of 172 sq ft and made the glider very difficult to handle. It was not a success.

Pilcher's third glider was the Gull, which had a greatly increased wing area of 300 sq ft but a weight cut back to that of the original—55lb. This design was again not entirely satisfactory. The "hanging" method of control proved inadequate for so large a machine in anything but a dead calm. The Gull was completed in Glasgow early in 1896 and was tried out in the summer of that year, only to be crashed several times during attempted flights in strong winds.

In the spring of 1896 Pilcher left Glasgow University and moved to Eynsford in Kent, where he had got a job with Sir Hiram Maxim, who was engaged nearby at Baldwyn's Park on a series of experiments aimed at solving the problems of powered flight. When he had settled down in his new home, Pilcher started work on his fourth glider, the Hawk, which was a marked advance on his previous designs. Made largely of bamboo, covered with linen and braced with piano wire, this glider—which was again of the "hanging" variety—weighed about 50 lb and had a span of 28 ft 4 in and a wing area of 180 sq ft. The wings could be folded for transport and two small wheels on spring struts were provided as an undercarriage.

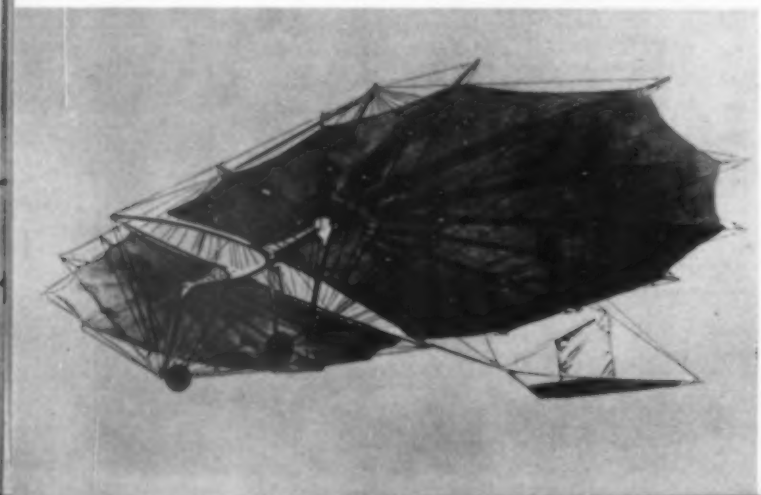
The Hawk was most successful. It was usually launched either by towing with a 400-yd length of fishing line, pulled by helpers, or by means of a rope and pulley system drawn by a horse. This latter form of launching was probably the practical beginning of winch launching as we know it today. (The first engine-powered winch launches were later also made with a "hanging" glider. This was at a gliding demonstration given by Capt. William Avery of the U.S. Army on a Chanute glider at the St. Louis World's Fair in 1903. Power was derived from a 10 h.p. electric motor.)

One of Pilcher's reasons for favouring towed launching was that it enabled him to reach greater heights above the ground than could be gained while gliding down the slope of a hill. He believed that, if he could get high enough, he would be able to make use of the up-currents which he could see soaring birds using. A favourite method of launching involved taking off from the top of one hill, towed by a light line which passed across a small valley to a pulley mounted on the summit of a neighbouring hill. After the line had been passed through this pulley, it was taken to helpers who pulled on it as they ran down the hill. In this way considerable heights were attained over the intervening valley, where Pilcher hoped to find up-currents. It appears that, unfortunately, he never succeeded in contacting one.

Between 1896 and 1899, Pilcher made a large number of successful glides on the Hawk near Eynsford. His best effort was on June 19th, 1897, when a distance of over 250 yd at a height

The Hawk, Pilcher's fourth glider, as reconstructed. (Right) The designer making one of his successful flights.

Science Museum photographs



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A BRITISH GLIDING PIONEER . . .

of nearly 200 ft above the bottom of the valley was achieved. The glider's minimum rate of descent was about 5ft/sec.

In June, 1896, Pilcher again visited Lilienthal and on this occasion was permitted to try out the latter's new biplane glider. He afterwards apparently brought back to England one of Lilienthal's monoplanes, which he purchased from the German—who was, unfortunately, to be killed soon afterwards while continuing his gliding experiments in the Rheinower Hills, near Stöllen, on August 10th of that year.

Soon after his return from his second visit to Germany, and inspired no doubt by Lilienthal, who had put an engine—driving flapping wing-tips for propulsion—in one of his own gliders, Pilcher turned his attention to obtaining a small oil engine which would drive a propeller. He planned to install this in a monoplane of similar construction to the Hawk. After failing to find a suitable engine, Pilcher decided to build one of his own. This was to be of about 4 h.p.—nearly twice the power he calculated he needed for sustained flight after a towed launch had got the machine into the air. The engine was to be installed in the nose of the aircraft, in front of the pilot, and to drive a 4ft pusher propeller by means of a shaft passing above the pilot's head.

Although Pilcher never completely resolved the problem of controlling a flying machine about its three axes—the solution to which was the vital ingredient in the Wright brother's final success in 1903—this might not have prevented him from achieving successful powered flight. Pilcher was, perhaps, more likely to have succeeded even than Lilienthal because his designs seem to have been more stable than the German's and because he had already practised a form of controlled powered flight during his towed launches.

In the years 1898 and 1899, Pilcher spent as much of his time as he could spare from his other activities, working on the powered aeroplane project in the Great Peter Street, Westminster, premises of the engineering company, Wilson and Pilcher, Ltd., which he formed early in 1898 with a partner, Walter G. Wilson, to work out inventions and ideas for patents. This company later produced a motor-car design which was afterwards taken over by Armstrong Whitworth.

In addition to building the engine for his new monoplane during 1898, Pilcher made many experiments in the first part of 1899 with some kites built and lent to him by the Australian pioneer Lawrence Hargrave. As a result of these trials, construction of a triplane was undertaken by Wilson and Pilcher in 1899. This was to be tried first as a glider for comparison with the monoplanes previously used. Pilcher was also active at this time in trying to gain support from various prominent people for the formation of a new company to exploit the many uses he foresaw for a successful powered flying machine.

In the event, the experimenter did not live to achieve the ultimate triumph of powered flight. This was to go to the American Wright brothers, who were to make the first powered sustained and controlled flight in history, on December 17th, 1903—only four years after Pilcher's death.

In September, 1899, Pilcher was staying at Stanford Park near Market Harborough, Northants, on a visit to his friend, the son of the then Lord Braye. He had with him the triplane glider and the Hawk. September 30th was a gusty day and both the gliders got soaked with rain; but Pilcher was persuaded to give a gliding demonstration to some members of the Aeronautical Society who had come to see him. He attempted one towed-launch in the Hawk, but the tow-rope broke. During a second attempt, a bracing wire to the tail gave way under a gust load during the launch and Pilcher was seriously injured when the tail collapsed and the Hawk dived into the ground from a height of about 30 ft. Still only 33, he died two days later, on October 2nd, 1899, without having regained consciousness, the first Briton to be killed in a gliding accident. The remains of the Hawk were rebuilt early in 1909 by T. W. K. Clarke and Co. of Kingston for exhibition at the first British Aero Show which was held at Olympia in that year. The glider is now preserved in the Royal Scottish Museum in Edinburgh. Unfortunately, neither Pilcher's powered aeroplane nor the triplane glider have been preserved.

THE NAVY'S ESTIMATES—

THE Admiralty's *Explanatory Statement on the Navy Estimates, 1956-57*,* reports that construction of the aircraft carrier *Hermes* and the modernization of *Victorious* are proceeding satisfactorily. When completed these ships will be capable of operating the next generation of aircraft. The four front-line carriers now in the active Fleet are *Ark Royal, Eagle, Albion* and *Centaur*, and the trials and training carrier is *Bulwark*. All have angled decks and the *Ark Royal* also has steam catapults. This year *Centaur* will be taken in hand for the fitting of steam catapults as well as improved radar and communications, and *Bulwark* will replace her in the active Fleet. Another light fleet carrier, *Warrior*, is also about to complete a modernization which includes fitting an angled deck. In subsequent years other carriers will be brought up to date in their turn. The first prototype N.113 is expected to carry out its first deck-landing trials very shortly; the D.H.110 is developing satisfactorily and has shown itself "a very good performer."

The numbers of naval pilots and observers are now satisfactory, and no difficulty is expected in filling requirements during the coming financial year.

—AND THE ARMY'S

ISSUED by the War Office, the *Memorandum Relating to the Army Estimates, 1956-57*,* states that our troops in Malaya are full of praise for the support given by the Royal Navy and the R.A.F. The volume of air transport by helicopter, Pioneer and supply-dropping aircraft has steadily increased, and all calls by the Army have been met. The technique of Army/Air co-operation has risen to a very high standard and gives some indication of the future scope and importance of air transport, supply-dropping and air reconnaissance in all forms of military operations.

One independent infantry brigade will be in constant readiness to support the civil Government in overseas territories, and the Air Ministry have agreed to provide a flight of light aircraft to support this brigade.

An Army/Royal Air Force Joint Experimental Helicopter Unit has been set up to collect information by practical trials, so as to enable the two Services to determine whether helicopters (and other aircraft capable of landing in confined spaces) are likely to be a practical and economical means of solving the Army's problems of mobility in future war. The first flight of six helicopters is now carrying out preliminary trials and a second flight will be formed during 1956. The whole unit will take part in trials with troops during exercises in Germany this year.

Air trooping has continued to be the main means of movement of Army personnel to and from the Middle East, the Mediterranean area and East Africa. Air trooping has also been used almost exclusively for movement to and from the Caribbean and West Africa. The service to the Far East, which has been carrying rather more than 1,000 passengers of the Services each way a month, has on the whole worked satisfactorily. As a result of complaints of overheating of the aircraft on the ground at intermediate stops east of Cyprus, arrangement was made during the summer to hire mobile air conditioning apparatus from British Overseas Airways Corporation at these stops.

Another development in air trooping has been the movement of Gurkha personnel and their families to and from leave in Nepal, by air between Singapore and Calcutta in two six-week programmes in the spring and autumn. Travel by air instead of sea results in a considerable saving in journey time and thus increases the operational strength of Gurkha units.

* *Both Navy and Army statements are published, price 9d each, by H.M. Stationery Office.*

DIGITAL-COMPUTOR PROBLEMS

THE Technical Section of the Society of British Aircraft Constructors has published a manual of problems arranged for digital computation.

In 1952, says the Society, it became clear that, although aircraft and engine companies were obtaining their own digital computors, members would still make use of machines available elsewhere in industry. On investigation, it was found that problems of similar character were being presented to the computors in different forms, this duplication leading to delay and increased cost. It was evident that the problems could be arranged in a standard form, and accordingly the Society set up their Electronic Computors Panel, whose major function was to standardize the arrangement of problems.

The standard forms in the manual relate to those problems which in the first place involve a considerable amount of computation and which occur frequently in aircraft design. The presentation involves a mathematical statement of the problem, together with a typical example the solution of which is known. The data sheets give no information on how to set up the problems; the necessary data can be found in the referenced reports quoted.

The price of the manual is 25s, and additional standard forms will be available, price 1s per page, when cleared for issue. Inquiries should be made to the Technical Section, Society of British Aircraft Constructors, 29 King Street, St. James's, London, S.W.1.

THE DEFENCE DEBATE

Aircraft and Missiles Discussed : Notable Speech by Supply Minister

SPEAKING in the Defence Debate on February 28th, Sir Walter Monckton, Minister of Defence, said that the Victor bomber had features which might make it more effective and more suitable than the Vulcan for certain operational rôles.

Next day, Mr. Reginald Maudling, Minister of Supply, said of the super-priority system, "In future we intend to concentrate on special bottlenecks, and to do it in two ways. This will help not only production, but also development, which is often held up in order to incorporate modifications as they become necessary. Our system will be that manufacturers who are having difficulty in obtaining certain supplies will get in touch with my Department, and, if we are satisfied that the difficulties are real and that special help is required, we are arranging that, on receipt of a request from us for assistance, the suppliers concerned will give special priority to those special requirements. It is the case of alloy steel which I have particularly in mind because that is the main thing which is giving trouble at the moment." The Chancellor of the Exchequer, Mr. Maudling said, had agreed to consider on its merits, in special cases, the early ordering of scarce materials where there was a long waiting time for delivery. Such ordering might involve a small financial risk, but the risk was small when the orders were "merely working up the queue," and the risk of not ordering early was much larger because there might be a hold-up later on a very big job for the sake of a small quantity of material.

Finally, they would continue the arrangements for deferring ex-apprentices involved in schemes of particular urgency from the defence point of view. This would be done administratively by consultation between Mr. Maudling's Department and the Ministry of Labour.

Concerning prices and profits, Mr. Maudling said: "A good deal is often said about the profits of the aircraft companies but I think that it is often not realized what a very wide range of activities these companies are engaged in. It is assumed that all or the major part of their profits are coming from the Government, but that is very far from being the case. In fact, I think it is generally true to say that the development contracts from the Ministry of Supply are about the least profitable form of contract in which these companies are engaged. We like to work on a system of prices fixed under competitive conditions. One of the advantages of having the V-bombers together is that we get that competition in this case.

"Where it is not possible to fix a price by competition it is fixed as soon as possible by reference to costs and by reference, which I think is a standard Government practice, to a percentage on capital employed. Generally, we try to get fixed prices as soon as possible, because I think that it is an incentive to efficiency. But in the case of development contracts it is impossible to fix prices until very late on, if at all, and in these circumstances we work on the basis of costs plus a fixed fee.

Advice on Costings

"I have been studying with some care this question of our costings. I believe myself that in fact our costings machine is very efficient. But I think it would be a good thing to get further outside advice on this matter, which is one in which there is a great deal of interest. I therefore invited Mr. Nutcombe Hume, chairman of the Charterhouse Group, and Mr. John Pears, the senior partner in the firm of Cooper Brothers and Co., chartered accountants, to advise me on the Ministry of Supply methods of fixing the prices to be paid for supplies of stores acquired by non-competitive contracts."

Later in the Debate Mr. Maudling said that in 1955 we produced 2½ times as many aircraft as were produced in 1950.

Of the Hunter he said, "The aircraft itself is an excellent one. That is agreed by the pilots who fly it. The difficulties which now remain are those with the formidable installation of four 30 mm cannon which were introduced at the same time as the aircraft. I do not quarrel with that decision, but it was a big decision to take to introduce simultaneously a new aircraft of advanced design and a new armament of very advanced design . . .

"The difficulties which were first apparent were the troubles relating to engine surge when the guns were fired, which occurred in certain marks of the Hunter, and also occurred at certain heights . . . That problem has been solved. The necessary modifications to the engines are being installed retrospectively. In fact, I should have thought that most of them would by now have been done . . ."

Of the Hunter gun-firing limitation Mr. Maudling said that it was not one that stopped the firing of the guns, but one that limited the amount that the guns could be fired. It had been found that the "enormous kick" of the big battery of cannon began to do some damage to small components in the nose. Modifications had been devised to strengthen the parts and deal with the trouble. "Obviously," said Mr. Maudling, "in the meantime, in peace-time, it is foolish to go on firing guns to an extent which damages aircraft. That is why limitations have been placed on the duration of firing of the guns. However, if it were necessary to take part in operations tomorrow before the modifications were installed, the guns could certainly be fired. The problem would then be that after a certain number of sorties we should have an increased maintenance requirement because of the replacement of the parts damaged by the firing of the guns . . . Whatever right hon. and hon. Members opposite may think about the Hunter, it is interesting that people abroad, who have to pay money for the machine, seem to like it quite well. Apart from off-shore orders, nearly 200 Hunters have been exported to overseas customers."

Mr. Maudling said the Valiant was the equivalent of any known bomber available to the forces of either the United States or Russia.

Guided Missiles

He had this to say about guided missiles: "It is a mistake to imagine that one can fit a guided missile on an aircraft as if one were hanging a candle on a Christmas tree. It is a large weapon which can affect the aerodynamics of the aircraft, and it can affect the functioning of the engines if it is not carefully placed. More important still, there is a very substantial design task in running down through the wings to the missile the electrical and other complicated services.

"When the design of Hunters was made before 1950, our knowledge of guided missiles was very rudimentary, and from the start it was designed around the Aden gun installation. The Swift, which was designed later, was always intended to be the first aircraft to carry guided missiles. I want to make it clear that if the Swift was going into service as one of our standard fighters it would soon be fitted with and regularly using the Fireflash. But, as the House is aware, the Swift can only be used for limited purposes, and that also therefore limits the use to which the Royal Air Force will be able to put the Fireflash.

"The firms of Hawker and Fairey Aviation are producing a Fireflash version of the Hunter as a private venture. From the R.A.F. point of view the Fireflash version of the Hunter will not be completely designed, developed and available until a time when a later air-to-air guided missile is likely to be available. As I have said, though the Fireflash is more effective than any cannon and will be a useful weapon, it is the first of our guided missiles and later missiles will have more advanced features. The Royal Air Force will concentrate on missiles which come out later, but we shall be able to offer for export the Fireflash-Hunter combination. I hope we shall be able to offer it to many friendly countries."

Mr. Maudling said that we were constructing intercontinental missiles with a very long range, and that we should soon need additional land for test grounds for rockets and rocket motors. Negotiations were in hand, he said, for a site in Cumberland—Spadeadam Waste.

He thought it was perfectly true to say—broadly speaking—that in the development of guided missiles this country was three or four years behind the United States. The Fireflash was produced in six years from the start of the design stage to delivery to the R.A.F. An American ground-to-air missile had taken nine years to develop and we hoped to develop a similar weapon in about the same time.

Mr. Maudling said that we were setting up a system of project officers to look after each important development project, and went on: "How can we do something to provide greater incentives to industry and, at the same time as greater incentives, greater penalties? That too is an extremely difficult problem, and it has been studied by successive Ministers of Supply over a long period. There is, in fact, a great deal of literature on the subject in the Department, headed 'Sticks and Carrots.'

"The difficulty in the case of development is not to decide what incentive or penalty to give to someone but to decide when an incentive has been earned or a penalty deserved. It is extremely difficult, in developing something like an aircraft, to specify exactly the performance that is required. Many of the objections against aircraft when they get into the hands of the Services are more of a qualitative than a quantitative character.

(*Concluded at foot of page 275*)

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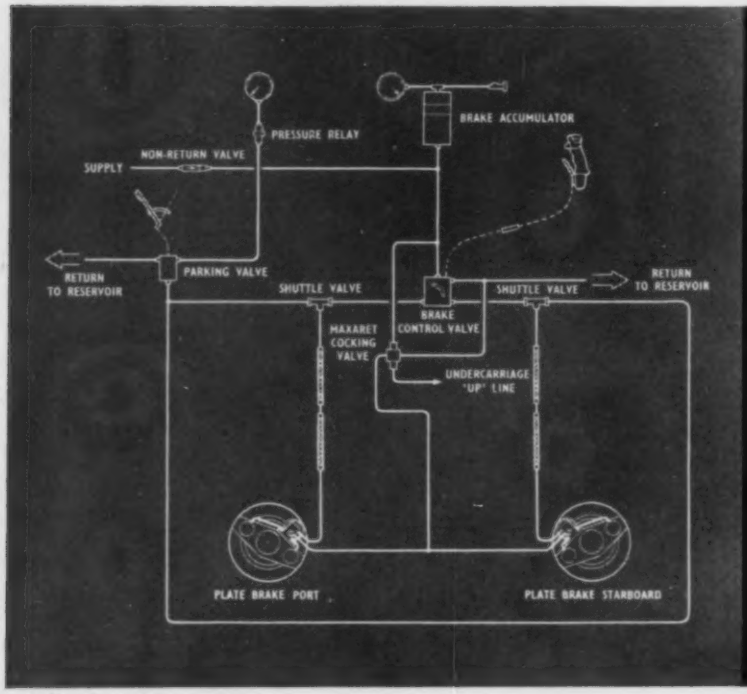

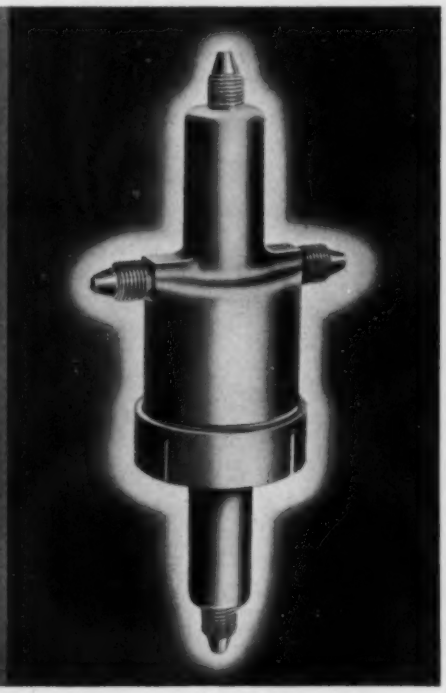

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SPECIALISTS IN EQUIPMENT FOR BULK STORAGE INSTALLATIONS

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Wherefore Art Thou Romeo?

THE new aeronautical alphabet is cumbersome, to say the least. We are now to have one-, two- and three-syllable words; and although ground-control and flight staffs will undoubtedly have to use them, they are far outnumbered by general ground staff and office wallahs, who use the present method for verbal clarity and who will either continue to use it or restrict their use of breath to letters only.

Most, if not all, of the old sounds occur somewhere in the new words, so why replace Jig Nan by Juliett November? If the change is made for the benefit of foreigners, well, even a Red Indian can say "How"! Personally, I think the whole thing's a lot of Charlie-Oboe-Charlie-King.

"What things we have seen,
Heard words that have been,
So nimble and so full of subtil flame."

Greenford, Middx. F. J. FELLOWS.

No. 18 Squadron

WITH reference to Part 3 of the article on the history of 18 Sqn., published in *Flight* of February 18th, I think I can throw some light on the apparent "fading away" of the squadron after the end of September 1946.

At that time I was serving as a navigator with the unit at Ein Sheme in Palestine. Shortly after W/C. Peck was posted and S/L. Barden assumed command, 18 Sqn. was merged with 38 Sqn., then based in Malta under, I think, W/C. Wasse. No. 18 Sqn. became "B" (18) Flight, 38 Sqn., subsequently being joined in Palestine by "A" Flight and leaving a two-aircraft detachment in Malta.

The "(18)" in our title implied that this flight was intended to form the cadre of any subsequently revived 18 Sqn.

As far as I can tell from my log-book this state of affairs continued until some time in January 1947, when "B" (18) Flight became "B" (87) Flight, now intended as the cadre for a reformed 87 Sqn.

A very full pictorial scrap-book of the work of 621/18/38 Sqns. on illegal-immigrant patrols was maintained, at least up to my release from 38 Sqn. at the end of March 1947. Whether or not this document still exists I do not know.

Monkton, Ayrshire. ERIC W. BOWKETT.

Britain's Airline Policy

MAY I be permitted to comment on the letter signed "Icarus" in your February 24th issue? I would agree when he states that the several aims of B.O.A.C. are incompatible, and thus its success depends upon the nicety of the balance that is struck. The public may consider that B.O.A.C. is moderately successful in this, but do those of us more closely concerned with the industry? In spite of Government "hot-housing" has not B.O.A.C. failed to show a real profit overall since 1946? It has failed with British types, and failed with American types, too! We hear that some of the L749s will soon be on the way out, after being acquired at fabulous expense only last year. What truly commercial company could operate in this way and still face the shareholders?

I suggest that "Icarus" gives the words "B.O.A.C." and "British aviation" synonymity. But B.O.A.C. is no more than another British company—favoured and protected as others are not. What we really need is five or six *national* British airlines, each with power and wealth enough to select the most competitive aeroplanes in the world's markets. And wouldn't this be the stimulant and target our manufacturing industry needs?

But we cannot have such a state of affairs as long as the words "protection of the Air Corporations" appears in the Civil Aviation Act. Delete this, and allow all British companies to apply for licences on all the routes—i.e., give everybody a chance of the high-revenue traffic—and we would be laying the foundation of a healthy, vigorous British air transport industry. Only that way can we hope to compete internationally, and with the U.S.A. in particular.

Ashford, Middx. PETER WILSON.

Whose Responsibility?

LETTERS have appeared at various times, not only *Flight* but in many aviation magazines, on the seeming lack of interest by the Air Ministry in preserving historic aircraft. I think the enclosed photograph will bear proof of that statement as it shows the front fuselage section of a Handley Page Hampden of Coastal Command, which was brought from No. 71 M.U. at Bicester to Bovingdon for the M.T.C.A. Fire Section to use an electric saw

The Hampden fuselage seen at Bovingdon.

on. When the photo was taken, early in December last year, the fuselage section was in fairly good condition, and most of the instrument panel was intact, together with the control column, which included a torpedo switch. According to markings inside, the aircraft was built by English Electric, and it is a pity it could not have stood at the side of the Lancaster fuselage section in the Imperial War Museum. The wing seen in the picture belongs to a Dornier brought from No. 71 M.U. for the same purpose as the fuselage. I wonder how many more such relics No. 71 M.U. has stored within its walls.

Hemel Hempstead, Herts. A. PEARCY.

PADDLE-WHEEL HELICOPTERS

A LETTER in our issue of February 24th brought from Mr. W. S. Shackleton, managing director of W. S. Shackleton, Ltd., a reminder that he described the Rohrbach "paddle-wheel" helicopter in *Flight* of November 2nd and 9th, 1933. The machine was known as a "cyclogiro" and was a product of Rohrbach Metall-Flugzeugbau G.m.b.H. ("Rohrbach Roland," mentioned in the letter of February 24th as the designer, was the name of a three-engined, all-metal, transport monoplane.)

An editorial in our issue of November 2nd, 1933, remarks that calculations made by Dr. Rohrbach, based upon tests made in Germany by the D.V.L., indicated that such a machine, fitted with a 240 h.p. engine, would have had a tare weight of 1,500 lb and a disposable load of 600 lb if vertical ascent were demanded. If this were not essential, and if a minimum speed of 13 m.p.h. could be tolerated, the load would be increased to 1,140 lb. At 2,100 lb gross weight, estimated maximum speed was 124 m.p.h. and the minimum speed zero. At 2,640 lb gross weight, i.e., with a disposable load of 1,140 lb, estimated maximum speed was 118 m.p.h., and as the minimum speed at this weight was 13 m.p.h., the speed range was more than 9 : 1.

Mr. Shackleton (whose association with Dr. Rohrbach began while the Beardmore company was building the giant Inflexible monoplane under Rohrbach licence and under Mr. Shackleton's supervision) himself held sole rights for the German cyclogiro in the British Empire. The project was shelved when the Rohrbach company was instructed to proceed with sub-contract work under the Hitler regime.

Artist's impression of the Rohrbach design of 1933.

Dr. Hooker congratulates Miss Patricia Ramshaw after presenting her with a set of books at the Folland apprentices' prizegiving (see below).

THE INDUSTRY

Dr. Hooker on Turbojet Progress

SPEAKING at the recent prizegiving to successful Folland Aircraft apprentices, Dr. S. G. Hooker, O.B.E., director and chief engineer of Bristol Aero-Engines, Ltd., and designer of the Orpheus turbojet engine fitted in the Folland Gnat, said that young men entering the aircraft industry as aeronautical engineers today had a dramatic future facing them. Aeroplanes were already flying faster than the speed of sound, and the next step was to fly at twice the speed of sound—i.e., between 1,500 and 1,800 miles an hour.

The turbojet had revolutionized the art and practice of aeronautical engineering. Before the Second World War, calculations showed that to fly at 500 m.p.h. the Spitfire would have needed an engine of 5,000 h.p., which would have weighed 6,000 lb. Today, the Orpheus gave the equivalent of 8,000 h.p. for a weight of only 750 lb.

Civil aviation, he said, was still only in its infancy. It would not be long before the design of supersonic airliners would begin. When they came into service it would be possible to fly from London to New York in five hours.

Dr. Hooker had been introduced by Mr. W. E. W. Petter, managing director and chief engineer of Folland Aircraft, who referred briefly to the progress of the Folland apprentice scheme during the year under review. A training workshop had been set up and was in full operation under the direction of a highly qualified instructor, Mr. W. F. Fowle. He had also been gratified by the manner in which apprentices had been able to fill vacancies in many of the company's departments; no fewer than 12 had recently been taken on in the design office. Mr. Keiser, the education officer, was moulding the apprentice scheme into a sound and practical undertaking.

Joe Taylor Retires from Shell

ONE of the true "old hands" of aviation, known to thousands of members of the industry and professional and private pilots throughout the world, retired from his present post on reaching the age of 60 at the end of last month. He is S/L. J. C. C. Taylor, M.B.E., A.R.Ae.S., A.I.Ae.E., M.S.L.A.E, R.A.F.V.R., aviation sales manager of Shell-Mex and B.P., Ltd. Happily, he intends to keep in touch: he will renew many old friendships during a world tour which he is making on behalf of a number of aviation companies; and he has also acquired the Shell-Mex Proctor, in which, with his wife, he intends to visit most of the Continental air rallies.

S/L. Taylor.

"Joe" Taylor was apprenticed to A. V. Roe and Co. in Manchester in 1912, and in 1914 he moved to Supermarine at Southampton, where he was in charge of engine testing. When war broke out he joined the R.F.C. as an observer, and in 1916 he was wounded; after a spell as an A.I.D. inspector he rejoined in 1917, this time as a pilot of single-seat scouts. After the war he returned to Avro, now as manager of their Southport establishment, whence he operated, with Avro 504s, the first internal scheduled passenger service, between Blackpool and Manchester. In the early 1920s he was in partnership with J. D. V. Holmes in Berkshire Aviation, exhibition-flying and joy-riding, and it was in 1923 that he entered the oil industry, joining British Petroleum as a sales representative. In the following year he was loaned to the Oxford University Arctic Expedition as a pilot. In 1929 he persuaded B.P. to acquire light aircraft for the use of their aviation section, and next year he designed a vehicle to give tank service at the many flying meetings then held—the first in this country expressly for aircraft fuelling. He also installed static fuelling plant at Croydon for supplying Lufthansa—again the first of its kind in Britain.

S/L. Taylor's aviation record is a remarkable one. His licence, No. 262, issued in 1919, is still current. During his twenty-seven years as a Shell-Mex and B.P. pilot he has accumulated 4,000 hours' flying, and up to the time of his retirement he was still logging some 150 hours a year. During the whole of this period the company received a no-claims bonus on its aircraft each year. Altogether he has flown 5,370 hours, 5,200 of them in powered aircraft and 170 in gliders; he has handled 57 powered types and 23 gliders.

As long ago as 1925 he founded the Jersey Branch of the Royal Air Forces Association, now established and recorded as the very beginning of the R.A.F.A. In 1942 he formed and commanded, in his spare time, the first R.A.F.V.R. gliding school for the training of A.T.C. instructors. He was Staff Officer 61 and 65 Groups, R.A.F., in charge of gliding training, and his service was recognized by appointment as M.B.E. From 1949 to 1954 he was Air Member for London Command, Territorial and Auxiliary Forces. He is chairman of the Royal Aero Club's private flying and air touring committee and a member of other R.Ae.C. committees.

Link Aviation and Air Trainers

IT is now possible to give further details of the arrangements, briefly referred to last week, whereby Air Trainers, Ltd., of Aylesbury, Bucks, are more closely associated with Link Aviation, Inc., of Binghampton, N.Y. The American company has subscribed 1½ million Ordinary shares of 1s in the British company at 2s per share, so that it now owns just over 50 per cent of the issued capital. Mr. Allan Williford, president of Link Aviation, has joined the Board of Air Trainers.

The transaction, says the Aylesbury firm, marks the establishment of a policy of close co-operation between the two companies, particularly in design and development. It is intended that interchange of visits shall take place regularly between members of the staffs in order to facilitate the exchange of information and to avoid duplication of design effort. Link Aviation is a member of the General Precision Equipment group of companies and, in addition to its work in the field of aircrew training equipment, manufactures a number of other products. It is expected that Air Trainers will manufacture some of these items.

It is also announced that Mr. W. Makinson, formerly superintendent of the Blind Landing Experimental Unit, Martlesham Heath, and now at the Ministry of Defence, is to join Air Trainers' Board on leaving Government Service at the end of this month. Mr. Makinson will become managing director on the retirement later in the year of Mr. A. T. Thorne, who will remain a director.

Instruments on View

SPEAKING at the opening of SIMA House—the new permanent display headquarters of the Scientific Instrument Manufacturers Association—Sir Norman Kipping (director-general, F.B.I.) said that the output of the British instrument industry was valued at £60m a year, of which £15m was exported. The fact that of 50,000 workers employed in the instrument industry 2,500 were engaged on research and development work augured well for the future.

The object of the display—which is at 20 Queen Anne Street, London, W.1—is to provide a centre where overseas visitors can see a representative selection of instruments made by over 140 member-firms in all parts of the country.

IN BRIEF

The technical liaison and publicity staff of Teddington Controls, Ltd., moved on March 1st from the Brompton Road, London, office to new premises at Colnbrook By-pass, West Drayton, Middlesex (Colnbrook 502-3-4). This is near London Airport, and the existing office at the airport has now been closed. The Brompton Road office is retained.

* * *

In our report (February 24th) of a Helicopter Association meeting, Mr. L. J. Ward's post with the English Electric Co., Ltd., was owing to a typographical error, wrongly described; he is chief electronic engineer, Luton division.

* * *

In order to satisfy the demand in Australia for Wolf portable electric tools, a manufacturing company, Wolf Electric Tools (Australia) Pty., Ltd., has been formed with a registered capital

of £A250,000 and a factory constructed on a site approximately eight miles from Sydney. Directors are Mr. D. K. Nicholas, Mr. B. E. Nicholas, Mr. R. A. G. Hardy, Mr. H. Richards and G. M. Wolfe.

* * *

Mr. Charles William Hotchen has been appointed to the new post of works manager (production) at the Cheltenham factory of Smiths Aircraft Instruments, Ltd., He served his apprenticeship at the Royal Ordnance Factory, Woolwich, from 1929 to 1934. He then went to Negretti and Zambra, Ltd., and was assistant technical manager when he left in 1948 to join the Plessey Co., Ltd., as chief engineer of their components division. In 1950 he joined the aviation division of Smiths as assistant works manager.

The commercial, buying, drawing and design departments of Head Wrightson Aluminium, Ltd., are now situated at the offices of the Head Wrightson Stockton Forge Division, Norton Road, Stockton-on-Tees. The works will remain for the present at Thornaby-on-Tees.

* * *

To meet requests for a publication setting out in general terms the main facts concerning the application of molybdenum disulphide as a lubricant, Rocol, Ltd., have produced a booklet on the subject. This publication, *Molybdenised Lubricants*, can be obtained on request from Rocol, Ltd., Ibex House, Minories, London, E.C.3.

DESIGN SERVICE

As aircraft become more complicated, the large airframe companies call increasingly on subsidiary firms to take over some of the design load. This holds good not only for the various ancillary systems which are required, but also for the basic airframe design work. There are a number of companies, approved by the A.R.B., which undertake work of this kind, and one of them is the aircraft division of E. G. Irwin and Partners, Ltd., with offices at Bracknell, Berks. The London office of the company has worked in a number of fields, from electronics to automobile design, and has even undertaken such tasks as the design of the mounting of the "moon-shooting" gun which was installed on top of the Shot Tower at the South Bank Festival site in London. A complete anti-aircraft gun was also designed, soon after the war, for the M.o.S.

The company originated in the early 1940s in A. C. Wickman's London design offices, and the present aircraft division was started at Bracknell by E. G. Irwin and Partners in August 1954. Then there were five draughtsmen; and this group will have been expanded to 60 by the time the company takes over new offices, which will be completed at Bracknell at the end of this year. The technical manager of the aircraft division is Mr. W. H. Burdon and the chief draughtsman and chief stressman are respectively Mr. D. J. Farmer and Mr. J. Cutler.

Work of this kind is very specialized and the success of the venture depends to a great extent on the certainty of producing results efficiently and economically within a time stated by the client. E. G. Irwin and Partners have achieved this objective, and they have worked or are working for a number of companies, both large and small. The greatest volume of work is at present being handled for Avro and Handley Page — various secret installations for V-bombers for the former company and several sections of the Herald for the latter. These include the flap structure, the internal tail structure, various of the hatches and cut-outs in the fuselage and part of the Leonides Major engine nacelles. In addition the company is "productionizing" the whole of the fuselage aft of the pressure bulkhead. They also carried out studies for the design of the cabin floor, which is, of course, part of the primary airframe structure.

Work of a very different kind is that undertaken for aircraft operators. Here the requirement is not so much for complete drawings and specifications as for simplified directions for structural work that is to be carried out in the companies' own workshops without complete production facilities. This calls for special technique and experience. Designs have been prepared for seating layouts, specially strengthened floors and such items as the long-range fuel tanks to be installed in a Viking for a ferry flight across the South Atlantic. Here the tanks had to be made in the client's own workshops and discarded after the flight. The solution provided was in the form of two wooden tanks with aluminium linings which were installed in the passenger cabin and connected with the aircraft's main fuel system. Another client was provided with skids for a helicopter for operations in snow, and also with special snow-shoes for the wheels, for landing on soft snow. For these helicopters windscreen de-icing gear, and a nosewheel-locking device, were also designed.

One of the more interesting ventures was the design, for B.K.S., Ltd., of undercarriage doors for Dakotas. The installation is light and simple to produce; and it gives the aircraft an increase in cruising speed of some 6 m.p.h. Taken as a possible reduction in direct operating cost, this increase in speed can lead to savings of several thousand pounds in a year.

The aircraft division of E. G. Irwin and Partners is working at full pressure on many projects of this type, and staff and premises are being steadily expanded. The company provides a little publicized but valuable contribution to the country's aircraft construction and operating industry.

One of E. G. Irwin's London design offices.

THE DEFENCE DEBATE

(*Concluded from page 272*)

"The real difficulty—I am trying to get all the advice I can, not only in this country but from other countries—is to determine when a really good job has been done and, equally, when a less satisfactory job has been performed. If we can decide between good and poor development, it is not really difficult to decide how to give greater incentives for the one and to apply penalties for the other. By and large, the fact is that the profits of the aircraft industry are made, not from development, but from production. The real incentive to organize work on development is the obtaining of a production order.

"For the last five years or so the aircraft industry has had enormous orders for aircraft. Ever since the Korean war orders have been pouring into the aircraft industry because of the needs of rearmament. Firms have known very well that if they did not get an order for one type of aircraft, plenty of other orders would come along. That situation is changing. The demand for military aircraft is falling. In fact the production of military aircraft will decline quite substantially in number over the next few years, as I have on more than one occasion told the House.

"In those circumstances, it is becoming far more important for a manufacturer to get a production order. In future, firms will be facing the position that if their development fails and they do not get the production order, there will be nothing else coming along for them in the way of military orders. That is the most important of all incentives that can be given to the industry."

The Vulcan and Victor would be improved, said Mr. Maudling, by greater engine power or greater power to beat the enemy defences. After them would come the ballistic missile and "at least one other bomber."

Of helicopters the Minister said that in view of the fact that the Secretary of State for War had decided that he could take the Saunders-Roe Skeeter, Government support and expenditure on the Fairey Ultra-Light helicopter would be cancelled. He added: "The Navy will obtain its future requirements from the Westland company, which is developing the S-58. The Royal Air Force will have the Bristol twin-rotor helicopter. At the same time the Fairey company will go ahead with the Rotodyne. This involves cancelling the Fairey Ultra-Light helicopter, the Naval application of the Bristol, and cancelling the Hunting Percival helicopter."

The present fighter position was that the Hunter and Javelin were to be followed by the P.1, and when the P.1 came into service we should have made up by a large amount the gap between our fighter performance and the Americans' fighter performance—the gap that was opened between 1945 and 1950. The P.1, in speed, armament and everything else, would stand comparison with contemporary American fighters. In that way we should have done much to close the gap between us. In guided missiles we had cancelled a certain number of projects and were economizing on some others.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

A.O.C.-in-C. on Tour

IN a Hastings C.4 of No. 24 Sqn., A.V-M. A. McKee, A.O.C-in-C. Transport Command, is to leave Lyneham, Wilts, on Sunday week for a 29,000-mile tour of F.E.A.F., Australia and New Zealand. A.V-M. McKee, who is also Inspector of Air Transport Services, will be accompanied for the first part of the journey by A.V-M. R. B. Lees, A.C.A.S. (Ops.), who will inspect arrangements for the air task force that is to take part in the forthcoming British atomic tests in the Monte Bello Islands. A.V-M. Lees will later go to Singapore for discussions with the A.O.C-in-C. F.E.A.F. before returning to England.

Appointments

IT is announced that A.V-M. J. G. W. Weston has been appointed A.C.A.S. (Signals) at the Air Ministry. His place as A.O.C. No. 90 Group, has been taken by A.V-M. L. Dalton-Morris.

A.V-M. Weston has commanded No. 90 Group since February 1954; before that he was C.O. of No. 1 School of Technical Training, Halton. He has completed the Imperial Defence College course and held the post of Director of Policy (Air Staff), Air Ministry, in 1949. He has been a signals specialist since before World War 2.

A.V-M. Dalton-Morris has been A.C.A.S. (Signals) since March 1952, before which he was Chief Signals Officer, M.E.A.F. He was Deputy Chief Signals Officer of Fighter Command during the Battle of Britain, when radar had its first big operational test and, later in the war, held a similar post at H.Q. Bomber Command. He formed the Signals Battle Training School at Chigwell and, in 1944, headed a team of signals specialists who developed and applied radio devices which upset the enemy's defence and control systems. He helped to plan the "spoof" operation which led the enemy to believe that the main invasion fleet was approaching the Pas de Calais.

R.Aux.A.F. 30th Anniversary

THE thirtieth anniversary of the R.Aux.A.F. was celebrated at a ball held in the Savoy Hotel, London, on February 24th. A birthday cake bearing 30 candles was cut with a sword by Air Chief Marshal Sir Francis Fogarty, Air Member for Personnel. The cake had been led in by the pipes and drums of No. 603 (City of Edinburgh) Sqn., which also accompanied Scottish dancing. Sir Anthony Eden, the Prime Minister, who is Honorary Air Commodore of No. 500 (County of Kent) Sqn., was at the last moment prevented from attending by pressure of work.

A.T.C. Boxing Finals

THE United Kingdom finals of the A.T.C. boxing championships were held in the Filton canteen of Bristol Aircraft, Ltd., on February 28th. The general standard of boxing was extremely high—better, in fact, than in any previous A.T.C. Boxing Championship—and a crowd of about a thousand spectators watched the programme.

The points scored by the various Groups were: No. 61Gp., 38; No. 66Gp., 29; No. 64Gp., 24; No. 63Gp., 17; No. 67Gp., 10; No. 62Gp., 7. The Lord Harewood Cup for the winning Group and 16 other trophies were presented by Air Chief Marshal Sir Francis Fogarty.

This fine portrait of the Duke of Edinburgh, by Anna Zinkeisen—seen alongside the easel—has been commissioned for hanging in the headquarters of Fighter Command at Bentley Priory.

Sunderlands Fly East

FOUR Sunderlands of No. 201 Sqn., Coastal Command, based at Pembroke Dock, are to fly 7,000 miles to Seletar, Singapore, to take part during March and April in anti-submarine and fleet-protection exercises with R.N., R.A.N. and R.N.Z.N. units. The detachment will be commanded by G/C. P. A. Lombard, Station Commander of Pembroke Dock. No. 201 Sqn. is commanded by S/L. D. G. Baird. The route flown will be *via* Marsaxlokk (Malta), Fanara (Canal Zone), Bahrein (Persian Gulf), Korangi Creek (Karachi) and Trincomalee (Ceylon).

No. 89 Sqn. History

THE history of No. 89 Sqn. is now being compiled from official records, but any personal recollections, anecdotes or photographs available from other sources would be much appreciated by the Officer Commanding, No. 89 Sqn., c/o Air Ministry (A.R.8), London, S.W.1. If required, material supplied will be returned.

R.R.A.F. Ferry Completed

ALL seven Vampire F.B.9 and T.11 ferry flights from Benson, Berks, to Salisbury, Southern Rhodesia, for the Royal Rhodesian Air Force have now been successfully completed. A total of 32 aircraft was involved and most of the flights were made by R.R.A.F. pilots *via* Istres, El Aouina, Idris, El Adem, Fayid, Wadi Halfa, Khartoum, Juba, Entebbe, Tabora and Ndola. The first batch was ferried in December 1953.

R.C.A.F. Air Rescue

LAST year R.C.A.F. aircraft flew 375 sorties totalling 5,460 flying hours on search and rescue missions. Of these sorties 160 were mercy flights, about 50 were searches for missing or distressed aircraft, and many were patrols for distressed or missing ships. There were also two major air operations in connection with forest fires in northern Ontario.

On one occasion 12 R.C.A.F. and 11 commercial aircraft flew 986 hours and searched 240,000 square miles of territory for a York lost on a flight to the DEWline radar chain. The wreckage was found and the surviving crew member rescued. On another occasion a Dakota made a 4,000-mile round-trip to a weather station 800 miles from the North Pole to bring back a scientist who was dangerously ill.

Municipal Liaison

CANBERRAS of the squadrons based at Waddington, near Lincoln, are now permitted to carry a representation of the Lincoln City arms on their tail fins. The arms include the red cross of St. George and a gold fleur-de-lys on a shield. This is the latest affiliation of a R.A.F. unit with a local community under the R.A.F. municipal liaison scheme. Bombers based at Wittering bear the blue and gold chequer-board markings originally held by the Earls of Warenne, who held the nearby manor of Stamford in the 13th century.

Deck-landing Safety

IT has been officially stated that, since the introduction of the angled deck and the mirror landing aid, deck landing accidents caused by pilot error have been reduced to less than one-fifth of the previous rate.

Dutch Uncles

WHEN the crew of four of a Dutch Avenger had to ditch in the Channel recently, the pilot of a Devon of 2nd T.A.F. Communications Sqn., *en route* from Wildenrath to Northolt, picked up the S.O.S. signal. He located the crew in their dinghy and homed an American SA-16 rescue aircraft to them.

F.A.A. "At Home"

THE following R.N. Air Stations will be "At Home" to the public on the dates mentioned: Eglinton, Londonderry, Northern Ireland, June 16th; R.N. Air Electrical School, Worthy Down, near Winchester, June 23rd; Lossiemouth, in Morayshire, and Anthorn, near Kirkbride, Cumberland, July 21st; Yeovilton, near Yeovil, and Culdrose, near Helston, July 28th; Brawdy, near Haverfordwest, August 4th; and Lee-on-Solent, Hants, on August 11th.

CIVIL AVIATION

298th VISCOUNT SOLD

TWO orders announced on March 2nd brought the Vickers Viscount order-book nearly up to the 300 mark. South African Airways, a new Viscount customer, have placed a contract for seven 810Ds (Dart RDa.7/1s of 1,800 s.h.p.), and a repeat order for Viscounts came from Aer Lingus who are to add three 808s (Rolls-Royce Dart 510s of 1,600 s.h.p.) to the existing Irish turboprop fleet of four Viscount 707s. The S.A.A. aircraft are to be delivered during the second half of 1958; their order is the second to be placed for the 810D, the first 12 of which are for Continental Airlines.

BIG SWISSAIR CAPITAL EXPANSION

A PROPOSAL to treble the share capital of Swissair is to be put forward at the airline's annual general meeting on March 26th. The present share capital of £1,118,315 is to be increased by offering 80,000 shares of 350 Swiss francs each (£20) to existing shareholders in the proportion of two new shares for every share held, and they will rank for dividends almost immediately. Announcement of this formidable Swissair expansion follows hard upon the airline's order for two DC-8s, at a total cost with spares of approximately £6m.

ELECTRAS FOR K.L.M.

IT now seems certain that K.L.M.'s evaluation of the Vickers Vanguard and the Lockheed Electra (*Flight* of February 11th) will result in an order for the latter aircraft. Unofficial reports state that a firm contract for 12 Electras has been placed at a cost, with spares, of £11½m. Having ordered nine Viscount Majors last June—the first British equipment ever bought by the 35-year-old Dutch airline—K.L.M. were regarded as possible purchasers of the Vanguard for the expansion of their medium-haul international services in the 1960s.

K.L.M. may thus become the first airline outside the U.S.A. to choose Electras, 104 of which have been sold to date. Delivery is being offered in 1959-60. The airline was, incidentally, the first outside the U.S.A. to order American jet airliners (eight DC-8s): other European operators—S.A.S., Air France and Sabena—later followed suit.

FLIGHT-TIME LIMITATIONS

AS is usual at this time of the year, informal discussions have been taking place between B.E.A. pilots and the Corporation about the forthcoming summer schedules. A difference of opinion has arisen concerning the maximum hours of duty that pilots can be expected to perform. Valid from April 1st the recent award of the tribunal set up by the M.T.C.A. to arbitrate on these matters limited flying hours to minima of 1,000 a year and 120 during 30 consecutive days; one-pilot duty periods, it furthermore stipulated, should not exceed 10 hr, or 9 hr with night-flying included. Reductions were recommended for "particularly exacting routes," with variations according to whether crews were composed of one or more pilots.

It is on the interpretation of these reductions that differences have arisen, and the matter is now being discussed between B.E.A. and the British Airline Pilots' Association. Reports that B.E.A. have proposed a hard-and-fast maximum of 16 hr duty, and that the pilots have counter-proposed with a 10 hr period, are misleading without interpretation of the reductions.

The thoroughness with which Douglas are flight-testing the first DC-7C is apparent from this picture: the comprehensive installation of recording equipment would not be unworthy of a new prototype.

As recorded last week, Mr. Anthony Milward (right) has been appointed deputy chief executive of B.E.A., responsible to Lord Douglas of Kirtleside.

B.E.A. IN 1955

ALTHOUGH a complete assessment of B.E.A.'s profits cannot be made until results for the full financial year (i.e. up to March 31st) are published in the late summer, a fair indication of progress may be gained from the Corporation's figures for the calendar year 1955. The net profit was £862,000, compared with a loss of £400,000 in 1954. This figure is distinct from operating profit, since it includes allowance for capital charges, aircraft depreciation, fuel tax, etc., which may amount to as much as £500,000. It seems clear that B.E.A. are set fair to improve substantially on the last financial year's net profit of £63,000, the first in the Corporation's history.

1649As FOR L.A.I.

SINCE the Lockheed L.1649A was first announced last June only two airlines, Air France and T.W.A., had, until recently, placed orders (accounting for 36 aircraft). This has been surprising in view of the capabilities of the new-winged Super Constellation, and the earlier delivery that for the past few months could be offered compared with the DC-7C (so far ordered by 11 operators). Air France and T.W.A. are now joined by the Italian transatlantic airline L.A.I. (an associate of T.W.A.) who have signed a contract with Lockheed for four L.1649As. Announcing the order, L.A.I.'s president, Prince Marcantonio Pacelli, said: "We made a study of all available aircraft of all types and found that the L.1649A alone could fly Rome to New York non-stop with full loads in all seasons."

WHO'S HOAXING WHO?

PREDICTIONS about the future of aviation are fair game for flaw-finders, even when they occur in the carefully considered columns of the *Manchester Guardian*. In an article in that newspaper's issue for February 28th, under the strong subtitle "The Great Jet Hoax," an air correspondent implies that the American bid to dominate the Atlantic is not really very serious.

We do not think there can be many people who believe that the seven transatlantic carriers who have ordered 707s and DC-8s did so "reluctantly," finding it "virtually impossible to have any accurate knowledge of which it is they will get or even when they will get it," and who "when taxed with their apparent folly . . . can only express their lack of enthusiasm in the expensive equipment they are buying . . ."

AERODROME OWNERS

TWO points of special interest were noted during the speeches at the annual dinner of the Aerodrome Owners' Association at the Hyde Park Hotel, London, on February 23rd. One was the reference by Mr. John Profumo, Parliamentary Secretary, M.T.C.A., to the future rôle of the helicopter in Britain: "Experience has shown that the helicopter does not look like being the answer to the problem of transporting people between London and its airport." By the end of this month, he said, the present experimental services will have "yielded all the information they can" and will be discontinued. The future rôle of the helicopter might lie in inter-city travel; perhaps "as early as 1959" we might have regular services, and experimental services in the Midlands would be carried out during the year. Provision of a South Bank (London) helicopter site would have to abide the outcome of proposed experiments with Bristol twin-engined helicopters.

The second significant point that arose concerned the possibility of a "free" Customs area at London Airport. In answer to a plea by Air Chief Marshal Sir George Pirie for a "new deal for an outmoded Customs system," Mr. Profumo said: "We may see something soon at London Airport that you will welcome."

In the House of Commons on February 28th the Secretary to the Treasury, Mr. Henry Brooke, said in a written reply to a question on this subject that the matter of alternative arrangements was being considered and the *Daily Telegraph* for March 5th reported that Customs officials, with representatives of B.O.A.C. and B.E.A., were to visit the "free area" airports of Frankfurt, Amsterdam and Zurich.

CIVIL AVIATION . . .

BREVITIES

PAKISTAN AIRLINES are expected to order turboprop airliners in the near future. The airline's general manager, Mr. Kenneth Bhore—who is also Pakistan's D.G.C.A.—has been at Weybridge studying the Viscount and Vanguard, and also at Burbank discussing the Electra.

* * *

The de Havilland Comet 3 is shortly to start test flights with the Rolls-Royce corrugated-nozzle jet-efflux silencer.

* * *

United Kingdom airports handled more than five million passengers during 1955, an increase of 20 per cent over 1954.

* * *

The A.R.B. has granted full approval to the Smiths S.E.P.2 autopilot, which is to be fitted to the Britannia and the Viscount Major.

* * *

A rail link between London and London Airport is to be the subject of a survey ordered by the British Transport Commission.

* * *

From January 1st, 1957, states an M.T.C.A. amending order, aircraft with exit-door sills more than 6ft from the ground must carry equipment to enable passengers to disembark safely in emergency. Another provision, valid since March 1st, 1956, regulates the height at which over-water flights must be made.

Mr. A. R. (Bob) Gate, formerly Cyprus Airways traffic superintendent, has been appointed B.E.A. representative in Egypt.

* * *

Two new directors have been elected to the Board of American Airlines. They are Mr. Ralph S. Euler and Mr. Walter W. Candy.

* * *

Anyone concerned with civil aviation may now exhibit his pride in the fact by wearing a maroon tie, patterned with small white deltas bearing the letters CA. Designed by Avigation, Ltd., of Ealing Broadway, London, W.5, it costs 20s 6d including postage.

* * *

As a result of B.O.A.C.'s decision to set up Canadian management independent of the U.S., Mr. R. H. Trench Thompson has been appointed Manager U.S.A., and Mr. G. S. McDougall has been made Manager Canada.

* * *

The ban on overtime, as from March 1st, threatened by engineers at the B.O.A.C. Treforest engine overhaul base, has been enforced pending the outcome of negotiations due to begin on March 16th. The dispute arose from the engineers' demand that the Corporation's turbine engines should be overhauled at Treforest.

* * *

Lufthansa, as from April 1st, is to introduce special cheap return fares on most German domestic routes. Reductions of nearly one-third are offered. An innovation to Europe is the airline's introduction at most of its terminals of flight despatch officers, whose responsibility is to relieve captains of much of the paper-work associated with flight-planning.

CLUB AND GLIDING NEWS

DURING 1955, aircraft of the Surrey Flying Club at Croydon flew a total of 2,180 hours (2,000 hr being logged between February 28th and October 31st). Thirty *ab initio* members were sent off on first solos during the year, and 23 members gained P.P.Ls. Included in these totals are seven A.T.C./C.C.F. pupils, six of whom obtained their P.P.Ls. The club's mass flights to Shoreham, Southend, White Waltham, Bembridge, Portsmouth and Elstree were found to be very popular, and are to be repeated this year.

At the beginning of 1955 the fleet of club aircraft consisted of three Tiger Moths, together with the original Hornet Moth with which the club began operation. During the year a further two Tiger Moths were added, and arrangements were made for the operation of a Messenger belonging to a member. A Leopard Moth and another Tiger are now similarly available.

The Link Trainer is now in use, and a retractable landing light has been fitted to one of the Tigers for night flying. Courses for the Commercial Pilots' Licence are now included in the club's curriculum, and several members are working for this licence at present.

AT the annual general meeting of the Northamptonshire Aero Club, the chairman, Alderman C. M. Newton, M.B.E., said that flying hours during 1955 had shown an increase of 196 over the previous year's total. He congratulated the club's instructor, Mr. L. C. Hilditch, on this achievement, which had been reached with the help of an influx of young flying members who had shown great keenness. Air Training Corps cadets given instruction under the Flying Scholarship Scheme had this year numbered only four, three of whom had qualified for P.P.Ls. The various social events, including an aerial garden party held at Sywell in August, had been well attended.

ELSTREE Flying Club intends to introduce a fourth Hawk Trainer into service soon, bringing the fleet to four Austers, four Hawks and a Gemini. The club's parent company, Derby Aviation, Ltd., is at present rebuilding a Chipmunk which is also intended for club use at Elstree. In spite of bad weather, 199 hours were logged during January.

GLIDING awards for 1955, announced by the British Gliding Association, are given below. They are to be presented by Mr. J. Profumo, M.P., at the B.G.A. ball in Londonderry House on Friday, March 16th. Money from the ball will go towards financing the British team for this year's world championships in France. Tickets, price £1 (including buffet supper), from the B.G.A., Londonderry House, 19 Park Lane, London, W.1.

De Havilland Cup (greatest height).—A. D. Piggott, Slingsby Skylark II, 22,800ft from Lasham on July 14th (U.K. gain-of-height and absolute altitude records).

Manio Cup (best goal flight).—Bernard Thomas, Slingsby Sky, 198 miles from Camphill to Ferryfield on August 7th (British 200 km and 300 km speed records).

Wakefield Trophy (longest flight) and **Seager Cup** (best two-seater flight).—Lorne Welch and Frank Irving, Slingsby T.42, 254 miles from Lasham to Louvain (Belgium) on May 14th (British two-seater distance record).

Volk Cup (best out-and-return flight).—Geoffrey Stephenson, Slingsby Sky, 68 miles at 27 m.p.h. over a triangular course from Lasham on August 1st (U.K. 100 km triangular speed record).

California in England Trophy (longest flight by a woman pilot).—Mrs. Anne Burns, Eon Olympia, 134 miles from Lasham to Ternhill on June 5th (Women's British national distance and U.K. Women's distance records).

Douglas Trophy (club with highest total cross-country mileage on three flights).—Surrey Gliding Club, 387 miles. Flights by Jeremy Brock, 132 miles from Lasham to Shawbury on June 5th; Walter Kahn, 111 miles from Lasham to Exmouth on July 26th; and David Derridge, 144 miles from Lasham to Plympton on July 26th.

A close runner-up for the Douglas Trophy was the Bristol Gliding Club, with 378 miles. The California in England Trophy has been presented by the Berkshire holiday camp of that name, and is awarded for the first time. The flights by Mrs. Burns and Mr. Brock were both first cross-country flights.

Members of the West London Aero Club, White Waltham, recent winners of the Lennox-Boyd Efficiency Trophy. Miss J. L. Hughes, chief flying instructor, is holding the trophy; Mr. S. G. Nicholson, a director of the club, is on the extreme left; and Mr. F. H. McDouall, secretary, is sharing a seat with "Muffin," the club's mascot.

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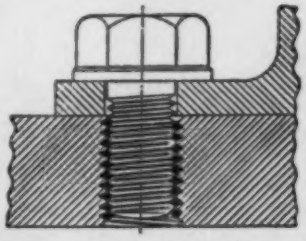

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THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:

APPLICATION No. 731. From Eagle Aviation, Ltd., of 29 Clarges Street, London, W.1, for a Seasonal Inclusive Tour Service with Viking or Dakota aircraft in conjunction with Sir Henry Lunn, Ltd. for the carriage of passengers and supplementary freight between London (Blackbushe) and Basle (Mulhouse) at a frequency of one return flight weekly on Saturdays during the season from December to March inclusive each year for a period of seven years, commencing 15th December, 1956.

APPLICATION No. 5/2. From East Anglian Flying Services, Ltd., of Southend Airport, Southend-on-Sea, Essex, for an amendment to the terms of approval of the Seasonal Normal Scheduled Service which the Company are approved to operate on the route Ipswich (optional)—Southend—Ostend during the season from Whitsun to September each year for the period up to 31st March, 1960, so as to operate at a frequency in accordance with the traffic demand instead of two return flights daily.

FROM British European Airways Corporation of Keyline House, Ruislip, Middlesex:

APPLICATION No. 732. For an All Freight Service with Pionair, Leopard, Elizabethan and Viscount aircraft for the carriage of freight between London Airport and Jersey and/or Guernsey at a frequency according to traffic demand for a period of 10 years commencing from date of approval.

APPLICATION No. 733. For a seasonal Inclusive Tour Service with Viscount and/or Elizabethan aircraft in conjunction with The Creative Tourist Agents Conference for the carriage of passengers and supplementary freight between London and Basle at a frequency of one return flight per week to be operated on Sunday night during the period from 1st June to 30th September, 1956 inclusive.

APPLICATION No. 734. For a Seasonal Inclusive Tour Service with Viscount and/or Elizabethan aircraft in conjunction with The Creative Tourist Agents Conference for the carriage of passengers and supplementary freight between London and Nice at a frequency of two return flights weekly to be operated on Saturday and Tuesday nights during the period from 1st June to 30th September, 1956 inclusive.

APPLICATION No. 65/1. From Manx Airlines, Ltd., of Ronaldsway Airport, Isle of Man, for an amendment to the terms of approval of the U.K. Internal Service which the Company are approved to operate on the route Isle of Man (Ronaldsway)—Glasgow (Renfrew) for the period until 30th April, 1960, so as to operate also an Internal Service during the season from May to September inclusive each year on the route Ronaldsway—Glasgow (Renfrew)—Edinburgh (Turnhouse) initially at a frequency of one return flight each Friday, Saturday and Sunday increasing further according to traffic demand.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [4932

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PUBLIC APPOINTMENTS

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APPLICANTS, under 35, must have a minimum of five years experience and be conversant with the installation and maintenance of low and medium powered M.F., H.F., and V.H.F. transmitters and associated equipment for remote control operation; installation and maintenance of H.F. and V.H.F. communications receivers including ability to carry out complete overhauls and re-alignment; installation and maintenance of H.F. and V.H.F. D/F. equipment.

POSSESSION of City and Guilds certificates in Telecommunications Principles, Radio Communication, Line Transmission and experience in installation and maintenance of radar equipment advantageous.

STARTING salary, £920-£1,000 p.a. depending on qualifications and experience, on scale £920 x £40—£1,200 x £50—£1,250.

APPLICATION forms and further details from Secretary, Rhodesia House, 429 Strand, London, W.C.2, closing date 31.3.56. [4909

ENGINEERS (aeronautical, mechanical, electrical) required at various Ministry of Supply experimental establishments for research and development work on guided missiles, rockets, gas turbines, aircraft and aircraft equipment. Qualifications Higher School Certificate (Science) or equivalent but a pass degree, H.N.C. or equivalent may be an advantage. Some experience in above duties desirable. Salary according to age, experience, etc., within ranges: assistant experimental officer £306 10s. (age 18) to £670; experimental officer (age 26) £745 to £920. Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting C.181/6A/BY. [4915

TECHNICAL Writers required by Ministry of Supply at Chessington, Surrey to prepare and/or supervise comprehensive technical handbooks on one or more of following; aero engines and their accessories; aircraft hydraulic, pneumatic, undercarriage, cabin pressure and air conditioning equipment, marine craft; armament; general, navigational and computing instruments; airborne and ground electrical components and installations; radio and radar; electro-mechanical and electronic equipment. Qualifications: British of British parents. Recognised engineering apprenticeship or equivalent in electronics. Appropriate experience. O.N.C. or appropriate City & Guilds Final or equivalent desirable. Salary: within £705 (age 30)—£831 p.a. Application forms from A.C.238, London Appointments Officer, Ministry of Labour and National Service, 1-6, Tavistock Square, London, W.C.1. [4927

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PUBLIC APPOINTMENTS

MINISTRY OF SUPPLY, National Gas Turbine Establishment, near Farnborough, Hants, requires mechanical engineers, aerodynamists, physicists, chemists and mathematicians for gas turbine research in experimental officer class. Qualifications: Higher School Certificate (Science) or equivalent, but degree or H.N.C. in an appropriate subject may be an advantage. Limited number of houses available from time to time for married candidates. Salary within range, E.O. (min. age 26) £745-£920; assistant E.O. £306 10s. (age 18)-£670. Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting C 183/6A/EY. [4916

PUBLIC NOTICES

THE COLLEGE OF AERONAUTICS

The Board of Entry of the College invites applications from suitable candidates for the two-year course which begins in October, 1956 and ends in June, 1958.

Candidates should be of graduate standard although the possession of a degree is not essential; a good Higher National Certificate is an acceptable standard.

The College, a post graduate institution, is devoted to the study of aeronautical science and engineering. The curriculum covers the five main subjects of Aerodynamics, Aircraft Design, Aircraft Electrical Engineering, Aircraft Propulsion and Aircraft Economics and Production. Instruction in the first year is designed to provide all students with a broad background of knowledge in all these subjects, with opportunity for limited specialisation in two or three of them. In the second year, students specialise more particularly, usually in one subject.

Experiments in the air are an important part of the work, both in the first year when all students take part in them and in the second year when they are linked to the specialist work of the departments.

Students who satisfactorily complete the course will receive the Diploma of the College.

Further particulars and details of the procedure for enrolment may be obtained from:

The Warden,
The College of Aeronautics,
Cranfield,
Bletchley,
Bucks. [4926

THE COLLEGE OF AERONAUTICS

Applications are invited for the Perring Scholarship in Aeronautics, valued £400 per annum, tenable at The College of Aeronautics. The successful candidate will be admitted to the two-year course at the College.

Applicants should preferably be honours graduates or final year undergraduates in engineering, mathematics or physics; applications from non-graduates with comparable qualifications will also be considered. Candidates must be British subjects domiciled in the United Kingdom.

Forms of application and statement of conditions will be forwarded on written application to:

The Warden,
The College of Aeronautics,
Cranfield,
Bletchley,
Bucks.

THE closing date for the receipt of applications is 18th May, 1956. [4924

THE COLLEGE OF AERONAUTICS

ENGLISH ELECTRIC RESEARCH FELLOWSHIP IN AERONAUTICS

Applications are invited for a Research Fellowship which has been established at the College by the English Electric Co. Ltd. The Fellowship is intended to provide opportunity for post-graduate research into problems of vibration or stability and control of aircraft, and is tenable for one year beginning on or about 1st October, 1956. The value of the Fellowship is £500.

Applications, giving full particulars of education and experience and quoting the names of three referees, are required by 1st May, 1956 and should be addressed to:

The Warden,
The College of Aeronautics,
Cranfield,
Bletchley, Bucks. [4925

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FLYING BASE: CROYDON AIRPORT. [0277

ENGINEER

required

for project and liaison duties on

Guided Weapons

Some previous experience of aircraft installations and electrical systems desirable.

The duties of this post are of a varied and interesting nature, in a rapidly expanding organisation with good prospects for promotion.

The successful candidate, who must be of good education and appearance, will be offered a good salary.

Please write, giving full details of previous experience, quoting Ref. 108, to:—

The Personnel Manager,
(Technical Employment),
De Havilland Propellers Limited,
Hatfield, Herts.

Sir W. G. Armstrong Whitworth Aircraft Ltd.

ARMAMENTS DIVISION

MECHANICAL ENGINEERS are required for work in connection with guided missiles. Previous design experience in mechanical handling or conveyor systems, together with some knowledge of rubber technology, would be useful, and it is desirable that applicants should possess H.N.C. or equivalent.

Pleasant working conditions and amenities are provided and an attractive superannuation scheme is in operation. The work is of a permanent character in a new and expanding field and salaries are good.

Replies will be treated in strict confidence, and should be addressed to:—

Technical Appointments Officer,
SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD.,
BAGINTON, NR. COVENTRY.
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The course will consist of practical flight tests in the College Dove, running concurrently with lectures on the underlying theories and methods of reduction, and will be similar to one held in September 1955.

It is intended for Flight Test personnel with limited experience in the complete analysis of test data.

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COPIES of the Syllabus and Forms of Enrolment can be obtained from The Warden, The College of Aeronautics, Cranfield, Bletchley, Bucks. [4888

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

INSPECTORS urgently required by Eagle Aircraft Services Limited, Blackbushe, for aircraft maintenance licensed or unlicensed but experienced on Viking and Dakota. Apply Chief Inspector. Tel.: Yateley 2371. [4933

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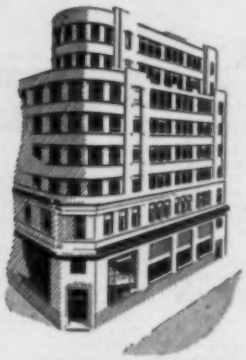

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The Company is now engaged on advanced problems of Aircraft, Helicopter and Guided Weapons design in one of the largest and most modern design offices in Central London. Working conditions are excellent. There is a luncheon voucher scheme in operation.

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ARMAMENTS DIVISION

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A number of Senior Engineers, both Electronic and Electrical, are required for work associated with the flight trials of guided weapons.

The work is of a very varied and interesting character, and includes system testing and the analysis of the behaviour of complex installations including mechanical and hydraulic components, in addition to electronic and electrical components.

A number of years' experience in electric and/or electrical engineering is essential for these positions, and service experience of radar, radio and telecommunications is a very suitable qualification.

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These positions are responsible posts and carry attractive salaries and excellent prospects.

Pleasant working conditions and amenities are provided and an attractive superannuation scheme is in operation.

All replies should be addressed to:—

TECHNICAL APPOINTMENTS OFFICER,
SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD.,
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Applications are invited from young men with initiative and imagination to work at Harwell on one of the most advanced nuclear reactor projects now being studied.

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Apply, giving fullest details of career, to:—

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(SENIOR AND JUNIOR)

Consideration will also be given to Draughtsmen with Mechanical, Structural or Electrical Experience.

STRESSMEN
(SENIOR AND INTERMEDIATE)

for both strength and flutter calculations.

WEIGHT ENGINEERS
(SENIOR AND JUNIOR)

The conditions of employment are good with progressive salary, good sports and welfare facilities, pension scheme, etc.

APPLICATIONS STATING AGE, PREVIOUS EXPERIENCE AND EMPLOYERS, SHOULD BE ADDRESSED TO THE

CHIEF DESIGNER

(h) **SUB-CONTRACTS ZONE STAFF.** (Senior and Junior) to work mainly in the office. Applicants should have had Engineering experience, be capable of handling correspondence and meeting Executives of Sub-Contracting firms.

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(j) **ENGINEERS TO BE EMPLOYED ON INTERCHANGEABILITY IN THE PRODUCTION ENGINEER'S DEPARTMENT.** Applicants are expected to work on their own initiative, in liaison with the aircraft design, jig and tool design, Planning and Inspection departments. The work includes from provisioning of interchangeability media, to application and proof assembly of components.

(k) **DESIGN DRAUGHTSMEN,** (Senior, Intermediate and Junior) for work on aircraft and guided weapons.

Applications, quoting date and prefix letter of advertisement, to: **Employment Manager, Vickers-Armstrongs (Aircraft) Limited, Weybridge Works, Weybridge, Surrey.**

SAUNDERS-ROE
LIMITED

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Senior, Intermediate and Junior

DRAUGHTSMEN

STRESS ENGINEERS

AERODYNAMICISTS

and other Technicians at their London, Eastleigh and Osborne, I.o.W. design offices.

Applications will be welcomed from experienced technicians who are keen to join an expanding organisation engaged on interesting and advanced projects of an important nature.

Conditions are good and assistance with accommodation can be given to those selected to work at Osborne.

Interviews may be arranged in London and in other centres.

Please send brief particulars, quoting ref. F/72 to the **Personnel Officer, Saunders-Roe Limited, East Cowes, Isle of Wight.**

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A number of Stressmen are required for interesting work in the Guided Weapons Division of SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD.

The minimum qualifications are H.N.C. in Mechanical, Aircraft or Structural Engineering together with at least two years experience in the stress office of an Aircraft or Guided Weapons organisation.

Pleasant working conditions and amenities are provided and an attractive superannuation scheme is in operation. The work is of a permanent character in a new and expanding field, and the salaries are good.

All replies should be addressed to:—**TECHNICAL APPOINTMENTS OFFICER,**
SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD.,
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SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT, LTD.

ARMAMENTS DIVISION

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All replies should be addressed to:—
Technical Appointments Officer,
Sir W. G. Armstrong Whitworth Aircraft, Ltd.,
Baginton, Nr. Coventry.
Quoting reference P/7/ARM/TAO.
[4942

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The object of the course is to prepare suitably experienced men for entry into their Drawing Offices at Osborne, I.O.W., London and Eastleigh.

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Those selected will receive reasonable salaries and enjoy full staff privileges during the training period.

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Applications, giving full details of age, previous experience, salary, etc., and quoting ref. F/73 should be addressed to the Personnel Officer, Saunders-Roe Limited, East Cowes, I.O.W. [4934

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ENGINEERS are required for liaison and installation work in connection with new types of aircraft instruments. Applicants should have a sound engineering background, with practical experience on electrical and mechanical instruments or allied mechanisms, and be willing to travel. Recent R.A.F. experience would be an advantage. Salary would be commensurate with experience and qualifications.

THESE posts would initially be based at the Barkingside, Essex, works and a superannuation scheme is available.

APPLY, giving full details of qualifications, experience, etc., to the Chief Engineer (Aviation Instruments), Kelvin and Hughes, Ltd., Winchester Road, Basingstoke, Hants. [4941

AIRFRAME/ENGINE FITTER, preferably with helicopter experience, required in Persian Gulf area for initial period of 15 months contract servicing S.55 helicopters. First class living accommodation, attractive salaries and free air passages offered. Preference given to single applicants or those prepared to live as bachelors. Apply Bristow Helicopters, Ltd., Henstridge Aerodrome, Templecombe, Somerset. [4945

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DE HAVILLAND AIRCRAFT COMPANY LIMITED,

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REQUIRE:

WEIGHT CONTROL ENGINEERS,

Intermediate and Junior.

GOOD salaries offered depending on experience and qualifications, superannuation scheme.

APPLICATIONS with full details to Personnel Manager, above address. [4892

SAUNDERS-ROE LIMITED

require a competent engineer to fill a very responsible position in a team of experts going to Australia in connection with the trials of a project of national importance.

ONLY men with considerable electrical/electronics or missile test experience need apply.

THE terms of engagement will be commensurate with the high degree of responsibility involved.

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Viking Captains and First Officers.
Pilots with SCPL as a minimum for Heron command.
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Experienced Stewardesses.

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A CHIEF of Special Projects is required by a well-known aircraft company.

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PHYSICISTS and Development Engineers.

LOUIS NEWMARK, LTD., require a physicist and a development engineer for work in their laboratories at New Addington on the development of autopilots and associated equipment. Previous experience in this field is not essential but candidates should have some knowledge of one or more of the following—control systems, servo mechanisms, capsule instruments, optics, gyroscopes, and small instrument engineering. A degree or similar qualification is essential. Salary in accordance with age and qualifications. Pension scheme. Apply in writing giving full particulars to Personnel Officer, Louis Newmark, Ltd., Prefect Works, Purley Way, Croydon, Surrey. [4918

A Chief Aerodynamicist is required by a well-known aircraft company engaged in transonic and supersonic work.

THE position carries executive status and the salary and conditions applicable to that rank.

APPLICATIONS will be welcomed from suitably qualified technicians. They will be dealt with personally by the Chief Designer, to whom they should be addressed, c/o Box No. 0595. [4938

NAVIGATORS. Qualified ex-service navigators required, good map-readers and preferably with photographic experience.

FOR one of the vacancies low flying experience would be advantageous. Applicants must be prepared for 6 months abroad yearly when generous allowances are paid. Permanent and pensionable position.

APPLY Hunting Aerosurveys Limited, 6 Elstree Way, Boreham Wood, Herts. (Elstree 2214.) [4940

YOUNG Engineers required by Armstrong Siddeley Motors for work on gas turbine aero engine performance prediction, flight analysis and associated problems connected with the flight development of engines. Degree, or equivalent required, a mathematical bias an advantage. Previous experience of this type of work desirable but not essential. Good salaries and pension scheme. Applications, with full details of age, experience and qualifications to Reference FL/P, Technical Personnel Manager, Armstrong Siddeley, Coventry. [0471

SITUATIONS VACANT

AERODYNAMICISTS of experience are offered the opportunity of joining an expanding team, working on very interesting projects.

THESE vacancies should appeal to men who like working in a friendly atmosphere.

THE conditions are those expected of a modern company and include assistance with accommodation.

GOOD salaries will be paid to suitably qualified and experienced men.

APPLY, giving details of experience, etc., to the Personnel Manager, Box 0577. [4931

MORTON AIR SERVICES, Croydon (CRO. 7171), invite applications for vacancies, Radio Officers. First class licences. Service home and overseas. [0014

WANTED.—A. and C. Engineer. Tiger Moth. Good wages, pleasant work, Lancashire. Accommodation arranged. Details to Box No. 0428. [4886

WANTED Pilot CPL. Permanent. Apply Chief Pilot, Yeadon Aviation Ltd., Yeadon Airfield, nr. Leeds. [4905

AIRCRAFT section leader design draughtsman required. Salary according to age, experience and qualifications up to £900 per annum. Pension scheme/superannuation fund in operation. Write or phone: BAYNES AIRCRAFT INTERIORS LIMITED, Langley Aerodrome, Bucks. Telephone: Langley 451. [4939

SITUATIONS VACANT

TEST and Laboratory Engineers required for gyro and electro mechanical instruments. Apply stating age, experience and salary required to S. G. Brown, Ltd., Shakespeare Street, Watford, Herts. [0147

WANTED. Commercial or private licensed pilot with engineering knowledge and experience, to fly and partly maintain D.H. Rapide in Middle East. Two years' contract. Apply Box No. 0596. [4944

RETIRED R.A.F. senior officers with N.A.T.O. and civil airline connections, required for senior sales position with firm of electronic engineers for marketing special airport equipment at home and abroad. Write giving full details and salary required to Box No. 0532. [4912

AIR traffic control officers required at Lympne Airport, Kent. Must be fully experienced. Excellent salary and conditions of service. Apply in writing with full details of qualifications and experience to the Personnel Manager, Skyways Ltd., Stansted Airport, Essex. [4950

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SCOTTISH AVIATION urgently require Planning Engineers for work on their Prestwick Twin Pioneer project. Applicants should have served a recognized Engineering Apprenticeship and have previous Aircraft Planning experience. Houses immediately available. Reply giving details of training and experience to Personnel Manager, Scottish Aviation, Ltd., Prestwick Airport, Ayrshire. [4858

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THE Aerodynamics Department of Armstrong Siddeley Motors has vacancies for both Senior and Junior Development Engineers for work on axial flow compressors, turbines and general airflow. A Degree in Mechanical Engineering and previous experience in this type of work an advantage. Initial salaries range from £650-£1,050 per annum dependent on age, experience and qualifications but superscale rates would apply to senior experienced men. Excellent prospects and good pension fund. Applicants should give full details quoting Reference Airflow 2, to Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [0466

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SCHEDULE TIME hr min	10.41	8.00	10.56	5.14	9.38	6.28	6.26	9.17
BLOCK SPEED m p h	368.5	368.8	357.9	376.7	330.2	370.1	401.4	370.8
PAYLOAD lb	28,000	28,000	27,353	28,000	28,000	28,000	28,000	28,000

These route analysis data have been computed to airline reserves and allowances

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